UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF ILLINOIS
EASTERN DIVISION

BALLY MANUFACTURING CORP.,	:	
Plaintiff	:	
vs.	:	CIVIL ACTION
D. GOTTLIEB & CO., WILLIAMS ELECTRONICS, INC., and ROCKWELL INTERNATIONAL,	:	78 C 2246
Defendants	:	

Volume II
Pages 128 through 278, inclusive

Deposition of: GREGORY COX

Taken by : Defendant Gottlieb

Before : Deborah Ruggiero, RPR-CP
Notary Public

Date : September 18, 1981, 8:30 a.m.

Place : Miller Kistler & Campbell, Inc.
1500 S. Atherton Street
State College, Pennsylvania

COUNSEL PRESENT:

A. SIDNEY KATZ, Esquire

For - Plaintiff

MELVIN M. GOLDENBERG, Esquire

For - Defendant Williams Electronics

SYDNEY M. LEACH, Esquire

For - Defendant Gottlieb & Co. and Rockwell

BENJAMIN NOVAK, Esquire

For - Gregory : Cox

GREGORY COX, called as a witness, being duly sworn, testified as follows:

DIRECT EXAMINATION CONTINUED

BY MR. LEACH:

Q Mr. Cox, have you had an opportunity to review the transcript of your first day of your deposition that was taken last Friday?

A Yes, I did.

Q Did you read the transcript?

A Yes.

Q Do you have any corrections to make to the transcript?

A As I recall, there were two. Very early in the testimony I referred to discussions I had had with Mr. Leach's firm. That was incorrect. I got the Sidney's confused. It should have been Mr. Katz's firm.

Q Could you find that please where --

A Yes.

Q -- where the correction needs to be made so that we can refer to it by page number?

A Page seven, line six. Excuse me, line five.

Q Page seven, line five?

A Yes.

Q What should be the answer there?

A It should be (reading) and I have a few handwritten

notes relating to conversations with various representatives of Mr. Katz's firm.

The other error was on page 101, line 22 -- excuse me, line 21 where I refer to an exhibit. That reference was incorrect. I referred to Exhibit 21. The reference should have been to Exhibit 20.

Q And that is at page 101, line 21?

A Yes.

Q All right.

Are there any other corrections?

A There was a third but I don't recall what it was, and I didn't bring my copy of the transcript. It was not significant to my recollection.

Q Do you recall then our telephone conversations on June 25th and 26th? And I mean the telephone conversation between you and I that you told me that you did not recall one way or the other whether anything was said about confidentiality at the Cyan, C-y-a-n Engineering open house?

MR. KATZ: Objection to the question. It is leading and lacking foundation that there was any such telephone conversation.

A This was the subject that was under discussion in the previous section of the deposition. I had given you my recollection on that phone call. I don't recall the specifics.

I do recall a discussion relating to providing a

statement for you or your firm and discussion relating to some questions you had. I do not have specific recollection of the questions or the answers. I do not remember that question and the answer.

BY MR. LEACH:

Q Do you deny that you told me in words or substance that you did not recall anything being said specifically about confidentiality at the Cyan Engineering open house?

A No, I don't deny stating that. I am stating that I don't recall making those statements.

Q Is it your testimony now that you do not recall one way or the other whether you said that?

MR. KATZ: Objection to the question. He was asked and he answered. He already said he didn't recall.

A Yes.

BY MR. LEACH:

Q During your last day of testimony, you testified that you recalled Steve Mayer expressly warning you concerning confidentiality at the Cyan Engineering open house. When did you recall Steve Mayer making that express warning?

A Do you mean when did he make the warning, or when did I remember that he made it?

Q When did you remember that he made it?

A I guess I have difficulty answering that question

because I never forgot it; therefore, I didn't have to remember it.

Q When did you first mention it to Mr. Katz or Mr. Novak or any representative of Mr. Katz's firm?

MR. KATZ: Objection to the question. It is lacking foundation.

A Are you asking when I discussed the subject of confidentiality and -- after a particular advisement to me regarding that matter to a representative of Mr. Katz's firm? When that first took place?

BY MR. LEACH:

Q No.

I am asking you when did you first tell either Mr. Novak or a representative of Fitch, Even, Tabin, Flannery & Welsh that you recalled Steve Mayer expressly warning you about confidentiality of the Cyan Engineering open house?

MR. NOVAK: Mr. Leach, perhaps it would help the witness a lot if you would establish a foundation.

Was there such a conversation and when was it and what was the nature of it and was that the first time? You might elicit these questions much more simply and quickly to get to the truth of the matter.

MR. KATZ: The problem is that these are so leading and they presuppose facts that may not be true. Therefore, the witness can't answer the question.

MR. NOVAK: I think it is confusing him.

MR. LEACH: Well, I suppose that you gentlemen were present last Friday when the witness made that statement and that would have to be the first time that he made it to you, unless he made it to you earlier.

BY MR. LEACH:

Q So what I am asking the witness is did he tell either Mr. Novak or a representative of the firm of Fitch, Even, Tabin, Flannery & Welsh that he was expressly warned about the confidentiality of the Cyan Engineering open house prior to last Friday when he testified to that effect at his deposition?

A I never specifically stated to either of the parties referenced that there was a warning or caution to the employees specifically regarding the open house at any time prior to the deposition last week.

There was extensive discussion on that subject in the testimony of last week's deposition. To the best of my recollection, as is stated in the record, and as I gave testimony last week, there were discussions and warnings given to myself prior to the open house.

I don't recall that they were specifically oriented towards the open house. I believe they were, but I am not absolutely certain.

There was a warning given to me when I first

entered the employment of the company. There were periodic warnings.

I am certain that there was one in the time frame prior to the open house. Whether there was a specific statement regarding the open house, I believe there was, but I am not certain of it.

I have given it some more thought over the last week, and I can't recall a specific event that related to the open house.

Q Is it your testimony that the expressed warning that you previously referred to that was given by Steve Mayer to you, that you are now not certain whether it expressly referred to the Cyan Engineering open house?

MR. NOVAK: Could you direct his attention to what testimony you are referring to that you are asking about, Mr. Leach?

MR. GOLDENBERG: I think that would take some doing.

MR. NOVAK: If it would take some doing for you, I presume it would take some doing for the witness.

MR. GOLDENBERG: If you have a copy of the transcript -- And I think we all know what the witness said. He said there was an expressed warning given prior to the open house.

MR. NOVAK: I don't recall that language.

MR. KATZ: I would like to see it myself in there.

MR. GOLDENBERG: You mean we are going to be back here another Friday, that is all.

A There was a great deal of testimony and questions concerning the subject and I -- Even after rereading the testimony, I have some confusion about all of the questions and answers relating to that topic and I am not clear on what all the testimony was.

BY MR. LEACH:

Q Well, I am not asking you what your testimony was.

What I am asking you is what the facts are, so I would like for you to testify without regard to what you said earlier but with regard to what the truth is, as best you can remember it.

Are you certain that Steve Mayer gave you an expressed warning with regard to confidentiality specifically referring to the Cyan Engineering open house?

MR. KATZ: I object to the question on the ground that the witness has already stated in this deposition his best recollection of the events, and you are merely continuing to rehash this subject to the point of abuse. And you refuse to point out where the testimony is, although you apparently know where it is in the record, since you have referred to it.

MR. GOLDENBERG: My note says that that is what the

witness testified to and it follows the testimony where he is telling about his wife and daughter four attending, so if that will help us find it, let's look for it if we are going to do it this way.

A I would reiterate my testimony of the previous deposition referring you to pages 85 and 86.

Line 13 on page 85 through line 17 on 86. That is a characterization of events relating to privacy and secrecy and policies within the company and my recollections of those events as they relate to my employment there and to the open house. And I would stand by those statements as being accurate.

And there it says, (reading) I can't state from specific recollection that there was an event during which it was specifically stated to all employees that we were having visitors and that we were to be reminded that all of this information was confidential.

MR. GOLDENBERG: Do you adopt your testimony down through line 17 on page 86 as well, sir?

A Yes.

MR. GOLDENBERG: I would like to read starting from line 13, (reading) . . . which I recall being enforced in the neighborhood at the time of the tour with regard to the fact that there would be nonemployees there, the families of Atari members. And for that reason, we should be cautious

about what information was disseminated.

A Yes. I stand by that.

BY MR. LEACH:

Q Were you ever specifically warned about confidentiality and secrecy by Steve Mayer with respect to the Cyan Engineering open house?

MR. KATZ: Objection to the question as being asked and answered.

A I think that is stated on page 86 of the transcript. It does not state who warned me.

To the best of my recollection, that warning was provided by Steve Mayer. The time frame was in the neighborhood of the tour. It related to the fact that other Atari employees and their families would be present in the facility.

I have stated that I couldn't guarantee that that warning was given to other employees and I can't -- I can't elucidate any more on the matter. I think that covers the subject.

BY MR. LEACH:

Q Well, was anyone else present when you were given this warning by Steve Mayer?

MR. KATZ: Objection to the question. He testified about it.

Are you going to rehash this entire thing?

MR. LEACH: I want to know whether his recollection today is any different from what it was last Friday.

MR. KATZ: Are we going to do this with each thing in this deposition and go through it painstakingly? How many children, what their ages are, et cetera, et cetera, all through this deposition? Is that what you intend to do?

A Do I need to answer this question again?

MR. NOVAK: Mr. Leach, if you just want to know, I think you ought to ask him whether or not his testimony has changed any between the time of the last deposition last Friday and today.

A No. My testimony remains the same upon reading the deposition, which was Tuesday evening. I did not find any areas that I felt were inaccurate.

I have testified that my recollection on these events is somewhat hazy in phases. These events took place seven years ago. To the best of my recollection, these events transpired as they appear in the testimony.

BY MR. LEACH:

Q Who else was present when Steve Mayer supposedly gave you a warning about confidentiality and secrecy at the Cyan Engineering open house if he did so?

MR. KATZ: You asked that question last week.

A I don't recall. I testified that I believed there were other people, but I don't recall who they were specifically.

MR. LEACH: I did not ask that specific question last week.

MR. KATZ: I think the record will show you asked substantially the same question last week.

BY MR. LEACH:

Q And are you still certain that Steve Mayer expressly warned you about the Cyan Engineering open house?

MR. NOVAK: Mr. Leach, I am going to ask if you have something such as that that assumes things, would you prepare the foundation as to what you are referring to and not assume it in the question? It is very unfair when you ask a person are you still beating your wife -- It is a very unfair question, and that is the nature of these kinds of questions.

MR. LEACH: Well, every time I try to ask a foundation question, you object because you say that it has already been testified to and I can't ask a foundation.

MR. NOVAK: I am asking you to lay a foundation. If you wish to make a specific reference and ask something about that or further inquire into it, that is certainly proper. But I think that trying to assume things into the question -- I don't see what you happen to be referencing.

I don't recollect it. I don't know where it is in this transcript.

On page 84 there is a single reference to Steve Mayer and I am not sure if there are other things you are referring to, but certainly what is on page 84 cannot be assumed into the question you have asked.

MR. GOLDENBERG: Let's look at page 32, sir.

MR. NOVAK: All right. If that is what you are referring to, then direct his attention to that and you may ask other questions about it.

I have no objection to him at all being able to enlighten you as to all the knowledge he has concerning what occurred on this day. But I don't feel that what is on page 32 could be assumed into the question you have asked.

BY MR. LEACH:

Q Did Steve Mayer specifically warn you about confidentiality and secrecy as to the Cyan Engineering open house? And I don't mean with regard to company policies.

MR. NOVAK: Could I have that question read back, please?

(Referred to testimony read by Reporter.)

MR. KATZ: I object to the question as too indefinite as to what you do mean.

A I recall being readvised of basic company policy regarding confidentiality and the approximate time frame of

the tour and that that policy related to the tour and the open house. That answers the question to the best of my ability.

BY MR. LEACH:

Q And this was by who?

A By Steve Mayer.

Q And did Steve Mayer specifically refer to the Cyan Engineering open house?

A To the best of my recollection, yes.

Q I refer you to Greg Cox Exhibit 14 and Greg Cox Exhibit 23.

Do you find that expressed warning mentioned in either your affidavit dated March 5, 1981, or your declaration dated 7-9-81 (indicating)?

MR. KATZ: Could you read that question back?

(Referred to testimony read by Reporter.)

MR. KATZ: Objection to the question. It is calling for what is in a document that would speak for itself.

MR. GOLDENBERG: I don't understand this, Mr. Katz. You don't think the author of the document can be questioned? Is that what you are saying about it?

MR. KATZ: My understanding is that the question refers to what was in one of these documents. So what is in the document is shown in the document.

MR. GOLDENBERG: I don't think you have responded, but I assume the witness is going to answer.

MR. NOVAK: Would you reread the question that Mr. Leach asked?

(Referred to testimony read by Reporter.)

MR. NOVAK: Mr. Leach, are you asking whether something is in the document?

MR. KATZ: No. He is only asking, it seems, whether the witness can find it in there.

A That's true, too. If I don't find it, that doesn't necessarily mean it is not there; is that correct?

MR. KATZ: He is testing your ability to find things in documents.

A I do not find a specific statement in either of these documents that you have referred to relating to a specific warning on confidentiality with regard to the open house.

BY MR. LEACH:

Q Do you understand your affidavit and your declaration?

A Yes.

Q Did you specifically state in either your affidavit or your declaration that Steve Mayer did specifically warn you about confidentiality of the Cyan Engineering open house?

MR. KATZ: Objection to the question. The declaration and affidavit state what they state, and I think it is improper to call on the witness here to tell you what the documents state or don't state.

A Might I ask what is the purpose for your question? Why are you asking me to restate or rephrase or repeat what is in these documents?

BY MR. LEACH:

Q This isn't my deposition.

Did you specifically state in either your affidavit or your declaration that Steve Mayer expressly warned you about the Cyan Engineering open house and expressly warned you that it was confidential or secret?

MR. NOVAK: Mr. Leach, you have a copy of the documents, don't you? And this can be submitted to the Court. The Court can either examine or decide what is in the document. The witness cannot add anything to what is there or take anything from what is there.

Do you wish to ask him about something that is there? I think you have already confused the witness, as he has already stated.

If you don't want to tell him what you are driving at other than the obvious, which is to read the entire document to you again into the record, then please proceed to something else or make some sense out of what is going on.

A The statements regarding confidentiality and policies within Cyan Engineering as they regarded my employment and as they regarded the open house are stated both in those documents, Exhibits 23 and 14 and in last week's testimony.

I was specifically warned about confidentiality in company policy when I was first employed by the company. I was periodically reminded of those policies. I was given a reminder prior to the open house.

Those policies were stated to me by Steve Mayer and possibly Larry Emmons on some occasions. To the best of my recollection, Steve Mayer gave me a warning regarding the fact that Atari employees would be present, that their families would be present, that company policy with regard to confidentiality would be enforced.

BY MR. LEACH:

Q Now, that is not stated in the affidavit or the declaration, is it?

MR. KATZ: Objection to the question as calling for what is in the document or not in the document. And what is in the document is self-evident from the document.

A The document -- Neither of the documents, Exhibit 23 or 14 contain a complete description of policies of confidentiality as they regarded to the open house.

What is included in those documents is various

discussions relating to a policy as it effects me during my work on the El Toro machine and during my employment at Cyan Engineering.

BY MR. LEACH:

Q When did you move to State College?

A Approximately the first or second week of April 1981.

Q You indicated that you remembered the functions that the program for the El Toro microcomputer controlled pinball game performed? Am I correct so far?

MR. KATZ: I object to the question as leading.

A Upon reviewing the computer programs, Exhibits 16 and 20 which describe the software in the El Toro game, my memory was refreshed with regard to the operation of the game and to the operation of the software. At that time I remembered how the -- how the game operated.

BY MR. LEACH:

Q Did you not remember how the game operated before reviewing those documents?

A I remembered general features of the game but not the specifics.

Q What general features did you remember?

A That a sequential polling sequence was used for sensing the switches, switch closures as the ball rolled over the switches and hit the bumpers. Had some recollection

of the hardware implementation with regard to the use of the INTELLEC 4 system.

Some recollection of the general design constraints used in the design of the hardware and software. I had a recollection as to the basic hardware control functions that were provided within the software.

Q Anything else?

A No.

Q What were the general design constraints used in the design of the hardware and software?

A The principal objective of the hardware design was to minimize the amount of hardware used in the fabrication of the electronic control circuits.

MR. KATZ: Objection to the question as lacking foundation.

MR. LEACH: Sidney, you are making ridiculous objections.

MR. KATZ: No. There is no testimony in regard to show that he knows what the design criteria are or design constraints were of the hardware system. You have never shown that he had anything to do with the hardware system design. It is our contention that he hadn't.

You are asking him to speculate and presuppose things. I don't think the objection is ridiculous at all. I think your questioning is actually presenting a distorted

record.

MR. NOVAK: You might establish whether or not he has any direct knowledge of the question or whether it is some other form of hearsay evidence. I don't know what his background was.

BY MR. LEACH:

Q How was the objective of minimizing the amount of hardware used pursued in the design of the software?

MR. NOVAK: Do you know of your own knowledge?

A Yes.

By minimizing the number of instructions used for controlling the pinball machine to minimize the extent of memory required. By using an input/output structure which minimized the number of integrated circuits required to provide control functions from the microprocessor to the game, and to minimize the number of circuits required to provide inputs to the microprocessor.

BY MR. LEACH:

Q What basic hardware control functions were provided in the software?

A Sensing the roll-over switches, thumper bumper switches, sensing the out-hole, sensing the coin switch, providing controls for the chimes for the LED score display controls to activate solenoids to output a ball for play, to eject a ball from a bumper, to control the lights

relating to the various switches that were activated when a switch was rolled over by a ball.

There were probably others, but I would have to take some time and refer to the hardware and software documentation to be complete on all of those.

Q Was the software divided into subroutines?

A There were subroutines in the software, yes.

Q What subroutines do you remember that were in the software?

A There were various subroutines dealing with specific hardware control functions, transmitting of input/output commands to the -- through the interface hardware and to the electromechanical portions of the El Toro game.

There were subroutines for managing the accumulation of the score.

There were subroutines for providing the LED output commands for control of the score display.

Q Is there anything else you can think of?

A Not offhand.

MR. LEACH: Would you read his answer back?

(Referred to testimony read by Reporter.)

BY MR. LEACH:

Q Do you remember any examples of specific hardware control that you were referring to in your first subroutine

group that you listed?

MR. KATZ: Could you read that question again?

(Referred to testimony read by Reporter.)

A Yes.

One example would be the output of commands to the lights associated with the playfield switches.

BY MR. LEACH:

Q What other examples of specific hardware control do you recall?

A Another example would be an input/output command for activation of solenoids associated with the thumper bumpers and the out-hole kicker.

Q Do you remember any others?

A Not without referring to the software documentation.

Q Referring to Exhibits 16 and 20 and any other exhibits that you may find helpful, could you identify any subroutines that you find in the software listed?

A Taking in sequential order as they appear in Exhibit 20, first is a subroutine for outputting LED score display through the ROM, R-O-M output ports.

Q What lines of the program listing of Exhibit 20 are included in the first subroutine which you just discussed?

A Lines 529 through 536.

Another routine is a delay routine for timing control within the game.

Q What lines of Exhibit 20 are included in the delayed routine?

A (Reading) 537 to 543.

The third routine is a solenoid activation subroutine.

Q What did the solenoid activation subroutine do?

A Provide hardware input/output commands. Specifically, output commands would select a specific solenoid that was to be activated and output a command to it causing it to be activated.

Q What lines of the software listing of Exhibit 20 are included in the solenoid activation subroutine?

A (Reading) 566 to 570.

570 does not appear on this copy. It was cut off during the copying process.

MR. KATZ: I would like to request that we make a copy of this particular page right now from the original so we don't forget about it, since we are missing one of the lines.

Do you have the original?

MR. NOVAK: That is Exhibit 20, right?

A Well, Exhibit 20 is what I worked with.

MR. KATZ: Is it shown in another exhibit?

MR. NOVAK: Is that what you have now?

A Yes. I have the original.

MR. NOVAK: You have the original Exhibit 20 that has been submitted?

A At one time I had another copy of this exhibit which had instruction 570 on it, and I noted what that instruction was. (Reading)

Final instruction is the return back from that subroutine.

MR. NOVAK: Is that what you have written there?

A That is written in hand in the exhibit.

BY MR. LEACH:

Q Do you recall what happened to the other copies of the software listing that you described?

A No. I may have disposed of it or I may have returned it to Mr. Schnayer.

MR. NOVAK: S-c-h-n-a-y-e-r.

A I don't recall what happened to that document.

MR. KATZ: Is it chopped off on the original Exhibit 20, the one given at the last deposition?

MR. NOVAK: Yes. It is written in hand on that one, AB something.

A ABLO.

MR. GOLDENBERG: The one I got with the affidavit filed in the patent office only goes down to 568.

I just want to be sure that the confusion level doesn't drop below a certain minimum value.

A Give it a chance. We will have plenty of time today to get confused.

The fourth routine is a match routine, which generates the digit used for comparison to the score at the end of the game for awarding a free game to the player on a match condition.

BY MR. LEACH:

Q What lines of the software listing are included within the match routine?

A (Reading) 544 to 551.

The fifth routine is a game increment routine used to increase the number of games remaining to be played.

MR. KATZ: Could I have that answer back, please?

(Referred to testimony read by Reporter.)

BY MR. LEACH:

Q What lines of the software listing of Exhibit 20 are included within the game increment routine?

A (Reading) 250 through 257.

The sixth subroutine provides sequential input/output logic for sensing of the switches enabling the LED displays and turning on and off playfield lights associated with the switches.

Q What lines of the software listing are included

within this sixth subroutine?

A (Reading) 238 through 243.

Q What inputs did the sixth subroutine respond to?

A It did not respond to inputs. All it did was enable a certain set of playfield switches to be input to the status sensing hardware of the interface electronics, which were later tested in the program.

Q Did it generate a strobe?

MR. KATZ: Objection to the question as indefinite.

A Certain software instructions within that subroutine caused control strobes to be generated within the hardware.

The seventh subroutine is a switch polling loop which individually tested playfield switches as they were enabled by the previous subroutine number six.

BY MR. LEACH:

Q What lines of the software listing of Exhibit 20 are included within the switch polling loop?

A (Reading) 512 through 528.

The eighth routine is used to set a specific bit within a memory location of the program, that bit being bit No. 1.

Q What lines of the software listing on Exhibit 20 are included within the eighth subroutine?

A (Reading) 552 through 558.

Q What was the purpose in setting bit No. 1 with the eighth subroutine?

A That purpose varied depending upon where the subroutine was called.

The first reference to that subroutine was used to turn the tilt light on.

Q Whenever this subroutine was called, could it operate on a specific memory location, or would the memory location in which it operated depend upon some variable?

A The memory location that -- It did not operate upon a memory location. It operated upon a memory word, which would be loaded into the accumulator portion of the hardware prior to the call to the subroutine. And the subroutine operated on the contents of the accumulator.

At the end of that subroutine the accumulator contents were then stored in registers 0 so that at the end of the subroutine the specific bit pattern that had been set was stored in the memory location, which was an integral portion of the 4004 microprocessor, that being the internal registers.

Q So the eighth subroutine would set the contents of bit No. 1 of the accumulator to a "1" or true state and then transfer the accumulator contents to register "0;" is that correct?

A Yes.

The ninth subroutine provided output controls to activate the knocker and chimes.

Q What lines of the software listing of Exhibit 20 are included within the subroutine?

A (Reading) 245 through 248.

The tenth subroutine was similar to the eighth in that it set a bit -- in this case, bit 2 -- to a true or "1" state in the accumulator and stored that in register 0.

Q Did it write over the previous contents of register 0?

A It stored the accumulator in register 0 and would have written over what was in register 0 at the time the subroutine was called.

Q What lines of the software listing of Exhibit 20 are included within the tenth subroutine?

A (Reading) 559 through 565.

The 11th subroutine provided the playfield switch sensing controls.

Q What specifically would the 11th subroutine do to provide playfield switch sensing controls?

A The playfield switches were enabled in groups.

This routine would select a specific switch within that group, would cause the interface hardware to connect that switch output to an input medium to the microprocessor,

which was then tested by the microprocessor to determine whether the switch was in an open or closed state.

Q What lines of the software listing of Exhibit 20 are included within the 11th subroutine?

A (Reading) 258 through 288.

MR. LEACH: Would you read his answer back to the previous question?

(Referred to testimony read by Reporter.)

BY MR. LEACH:

Q How was the interface hardware specifically caused to connect the switch output to an input medium? Do you mean a specific memory location?

A I don't recall the specifics. It was connected through one of the input port provisions within the microprocessor system.

I would have to review the software documentation to determine which specific input port.

MR. GOLDENBERG: Excuse me. Did you misspeak when you said "software documentation"? Did you mean hardware documentation?

A No. I can get that information from the software documentation.

MR. GOLDENBERG: You can get it from the software.

BY MR. LEACH:

Q Was the input port then transferred to a specific

memory location before it was tested?

A I don't recall. I would have to review the software documentation to determine that.

Q When was the last time that you reviewed the software documentation that you are referring to?

A At about the time I provided the first affidavit, shortly thereafter. Probably in April of this year, 1981.

Q All right. We can come back to that.

What other subroutines are in the software listing?

A There is a -- The 12th subroutine is really a series of subroutines having multiple entry points, the entry point being determined by the specific playfield switch which is being activated with a common exit point from the subroutine.

This set of subroutines provides the appropriate solenoid activation response and point value determination for the activated switch.

MR. LEACH: What were the last few words he said?

(Referred to testimony read by Reporter.)

BY MR. LEACH:

Q What lines of the software listing of Exhibit 20 are included within the 12th group of subroutines?

A (Reading) 289 through 407.

Q Did each of the series of subroutines jump to a specific line within the 12th subroutine before exiting?

A There were two exit points.

Q There were two exit points and not just one?

A Yes. There were a total of -- I believe there were a total of about 15 entry points.

It would take a more detailed examination of this documentation to determine that, but from a superficial look at it, there were a stated number of entry points and two exit points.

Q Can you identify the line that contains the exit points?

A The -- There are three exit points. Not two. And the exits are unconditional transfers rather than subroutine returns to various entry points within the score management software, which is the 13th subroutine, the score management routine.

Q Would the 12th subroutine always transfer control to the score management routine?

A I am not certain of that. I would have to take a closer look at the software to determine that.

On a cursory examination, that appears to be the case.

Q What three lines contain the unconditional transfers that comprise the three exit points that you have identified thus far?

A Well, there is an exit point for almost every

entry. I can give them to you in numerical order. (Reading)

They are on lines 291 --

Q Why don't we do it this way. Why don't you identify an entry point and then identify the associated exit point for each entry point?

A Okay. The first entry point is associated with the slingshots. (Reading)

That entry is in line 289; exit is on 291.

The second entry associated with the thumper bumpers, entry is on 293; exit is on line 297, 301 and 303 dependent upon the value of the thumper bumper activated by the ball.

The third entry point is associated with the E roll-over switch. That entry is on line 305; exit is on 310.

The fourth entry point is associated with the L roll-over switch.

(Discussion held off the record.)

A Where are we?

(Referred to testimony read by Reporter.)

A (Reading) Entry is on line 312 and the exit is on line 310 where it branches back to the E roll-over logic.

The fifth entry is associated with the T roll-over switch. The entry is on line 318; the exit is also on line 310 in the E roll-over switch logic.

BY MR. LEACH:

Q Would this program branch back to the E roll-over logic when entry was made at line 318?

A Yes -- No. It would branch back to the exit from the E roll-over logic rather than executing the instructions associated with the E roll-over switch.

Q Was that accomplished by statement No. 319?

A No. It was accomplished by statement 322.

Q What line of the program would control be transferred to after execution of statement 322?

A Line 307. There was common logic on these switches which saved the accumulator in register 7 and then jumped to the score management logic for servicing a 100 point switch.

Q Which statements accomplished the function of saving the accumulator in register 7? Is that statement --

A Statements 307 and 309.

307 and 308 set the right most bit of the accumulator to a "1."

307 sets the carry bit to a "1."

308 rotates the accumulator to the left shifting that carry bit which was set to a "1" into the least significant bit location of the accumulator.

And then instruction 309 stores the accumulator in register 7 and simultaneously loads the contents of

register 7 into the accumulator.

MR. NOVAK: Would it be inappropriate to take a break here?

A I think that would be entirely appropriate.

MR. LEACH: All right.

(A brief recess was taken.)

AFTER RECESS

DIRECT EXAMINATION CONTINUED

MR. KATZ: Could I have the last question and answer back?

(Referred to testimony read by Reporter.)

BY MR. LEACH:

Q We were on the fifth entry part and we were going through the --

MR. KATZ: He finished the fifth entry point I think, didn't he?

MR. LEACH: That is right.

BY MR. LEACH:

Q And we were going through the points in which you would enter and exit the 12th series of subroutines.

A Yes.

Q And we had just completed the entry with reference to the T roll-over switch at line 318?

A Shall I continue?

Q Please.

A The sixth entry is for the O roll-over switch, the first O, and we will refer to that as 01. (Reading)

That entry is at location 324; the exit is at 334.

The seventh entry is for the R roll-over switch. Entry at location 336 -- Excuse me. Exit at location 334. As similar to the previous cases, it causes the last four instructions of the 01 roll-over switch logic for exit.

Q What statement would transfer control to the 01 roll-over logic?

A That statement is shown on line 340.

That section of code has been modified by a patch somewhere in Exhibit 16. But on Exhibit 20 that exit is shown on line 340.

Q What change was made by the patch to the operation of the program with its load? With the statement added to it just before the transfer?

A Yes. The statement to save the contents of register 6 -- I am sorry -- statement saved the contents of the accumulator in register 6 prior to exiting this section of logic.

Q And then where would control jump to?

A To the location 01 + 6, which would be line 331 I believe.

Let me double check that.

It would transfer control to line 332.

Q What would the statements between line 332 and 334 do before the control exited?

A It would rotate the contents of the accumulator to the right shifting the carry bit into the most significant bit location of the accumulator moving all the bits in the accumulator to the right one location.

It would then store the contents of the accumulator in register 9 and would then exit to the score service logic associated with a 1,000 point switch.

Q The next entry point had been modified by a patch, had it not?

A Yes.

That entry point is for service of the 02 switch. The unmodified entry point as shown is location 342.

Q I am actually interested in the operation of the program as modified.

A The original program --

Q The original program looped back, would it not?

A Well, the original program used register 7 incorrectly as the storage medium for the status bit for the 02 roll-over.

It should have been register 6, which was used for storage of that bit. That was corrected in patch.

Q Are there any other entry points?

A Well, to finish the second 0 or 02 switch service, the entry point prior to modification was shown at 342. The exit was at 346 returning back to the logic for the E roll-over.

Q That is not the way it operated after modification, though, is it?

A No. After modification, the instruction locations would be changed.

I would have to refer to the patch log to accurately show what those were. But after modification, it exited to the service for 100 point switch portion of the score service routine.

Should I go on to the other entry points?

Q There is an entry point at line 348, and there is an entry point at line 355?

A Yes.

Q And there is an entry point at line 362 and there is an entry point at line 368?

A Yes.

Q And there is an entry point at line 374, is that correct?

A Correct.

Q And there is an entry point at line 378, is that correct?

A Correct.

Q There is an entry point at line 382, isn't that right?

A Yes.

Q There is an entry point at line 389, isn't that right?

A Yes.

Q There is an entry point at line 402, isn't that right?

A Yes.

Q Did I miss any entry points?

A No.

Q In the entry point at line 362 where was control of the program transferred to by line 366?

A To 4 memory locations following 348. That would be location 352.

Q Why was that done?

A To conserve use of memory.

Q What did line 352 do?

A It stored the contents of the accumulator in register 9, then jumped to the 1,000 point score service routine.

Q Were the contents of the accumulator always stored in register 9 for a 1,000 point switch?

A I would have to review this documentation in some detail to determine that. I am not sure.

Q Does that appear to be what is happening?

MR. KATZ: Objection to the question. It is calling for speculation.

A Let me refer to one of the other exhibits.

I am not certain about the use of register 9. At various times during the operation of the program it is used for different functions.

I am not certain if its use in this case is dedicated to association with a 1,000 point score.

In fact, in lines 368 through 372, line 370 shows a conditional test and both the 1,000 point and 100 point score routines can be entered based on the contents of register 9.

So I would say that 9 is not uniquely associated with a 1,000 point score of some sort.

BY MR. LEACH:

Q All right.

If we have gone through or listed all of the entry points listed on the 12 groups of subroutines, what other subroutines were in the program?

A Subroutines which manages the scoring for the game which accumulates the score, scores digits.

It contains provisions for a tens digit, a hundreds digit, a thousands digit and a ten thousands digit.

It activates the proper chime associated with a

score of the value ten, hundred or thousand.

There are actually three such routines. One for the 10 point service which is contained in lines 409 through 444. One for the service of 100 point scores on lines 446 through 455, and one for the service of 1,000 point scores on lines 457 through 483.

MR. KATZ: Excuse me. Could you just give me back the middle line, the middle series of lines for the 100 point score service?

MR. GOLDENBERG: It was 446 to 455 according to my notes.

BY MR. LEACH:

Q What groups of lines are you including within the 13th subroutine group that you have identified?

A (Reading) 409 through 483. (sic.)

That group of subroutines is associated with management of the scoring in the game. If you would like, we can call them three different subroutines; 13, 14 and 15.

Thirteen is the tenths scoring service; fourteen is the hundredths scoring service; fifteen is the thousandths scoring service.

A The instruction locations line numbers for those were previously given.

Q Are there any other subroutines?

A No. These are all the subroutines in the program.

Q Were any subroutines added to the program after it was modified?

A You are not going to object to that one?

MR. KATZ: Objection to the question.

MR. GOLDENBERG: Gentlemen, please.

A No. That one was so vague I am not sure what you mean.

Can you be more specific as relates to what you mean by modified? When, by what, where?

BY MR. LEACH:

Q Were any subroutines ever added to the software program?

MR. KATZ: Objection to the question as still being indefinite.

MR. NOVAK: You mean prior to this document?

MR. KATZ: Subsequent to it.

BY MR. LEACH:

Q I mean at any time to his knowledge. And you may refer to the patch log of Exhibit 16.

MR. KATZ: Maybe the problem is indefinite in what you mean by did he program. Does it reference --

A Exhibit 20 is the El Toro computer program.

Prior to this version of the program shown in Exhibit 20, in earlier versions of this program, subroutines were added to it.

Exhibit 20 -- This program was modified by patches shown in Exhibit 16.

A Exhibit 16 does not add additional subroutines to the program.

BY MR. LEACH:

Q So to your knowledge there were no other subroutines in the program on the date of this Cyan Engineering open house, is that correct?

MR. KATZ: Objection to the question as indefinite.

A To the best of my knowledge, the subroutines contained in the program version used at the Cyan open house had been listed as subroutines 1 through 15 previously discussed.

BY MR. LEACH:

Q Do you recall how the various memory locations in the INTELLEC microprocessor system were allocated for the El Toro program?

MR. KATZ: Objection to the question as indefinite.

A The allocation of memory within the INTELLEC system for the El Toro game is shown in Exhibit 16 and 20.

I do not specifically recall what was in each location. But that memory allocation is shown within those two exhibits.

BY MR. LEACH:

Q Were there memory locations that were used for

the storage of intermediate results or for the storage of scores? For example, register Nos. 1, 2, 3, 4, et cetera?

A Yes. The accumulator and the 16 registers of the microprocessor chips were used at various times during the execution of the program shown in Exhibit 16 and 20 for the storage of intermediate computational results, hardware status, hardware control signals, things of that sort.

Q Do you recall whether any of these 16 registers were dedicated to store a specific variable during program operation?

A Yes, I believe they were. I don't recall which specific registers and for which specific variables.

I determined that during my analysis of the program in February and March of this year.

Q Would a review of Exhibits 17, 18 and 19 assist you in recalling which memory locations if any were dedicated to specific variables during the program operations?

A No. But Exhibit 22 contains some notes relating to the subject.

Exhibit 22-A shows the allocation of registers 0 through 15 for the version of the El Toro program in Exhibits 16 and 20.

Q Why don't we go through those registers? What was register 0 allocated for?

A Register 0 and 1 were nondedicated. That is,

they were used dynamically for various different purposes at different times in the program.

Q So they were used in a sense as scratch pads?

A Yes.

Q What was register 2 used for?

A It contained a coordinant addressing word for enabling a bank of lamps, a bank of switches and enabling a specific LED display.

Q What was register 3 used for?

A Register 3 contained a control word enabling a specific lamp or switch within that bank of lamps or switches enabled by the contents of register 2.

Q What was register 4 used for?

A Well, back to registers 2 and 3, I am not certain without a review of the program that those were dedicated. They may have also been used at different times within the program for different purposes.

Q What was register 4 used for?

A Register 4 was used to store the status of the AC power phase detector.

Q What was register 5 used for?

A Register 4 was also used in conjunction with register 5.

These two registers taken together provided an indication of switch closure status. That is, those switches

on the playfield; register 4 indicating switch closure and register 5 indicating switch openings.

Q What was register 6 used for?

A Registers 6, 7, 8 and 9 were used for the storage of the on/off status of playfield lamps, each bit representing an on or an off state for a specific lamp within a playfield.

Q Anything else?

A No.

Q What was register 10 used for?

A Register 10 was used to store the tenths digit of the score.

Register 11 was used to store the hundredths digit of the score.

Register 12 was used to store the thousandths digit of the score and register 13 was used to store the ten thousandths digit of the score.

Q What was register 14 used for?

A Register 14 was used to store the ball count. That is, the number of balls remaining to be played for the game in play.

Q What was register 15 used for?

A Register 15 was used to store the number of games remaining to be played.

Q In other words, register 15 was storing the number

of credits?

A Yes.

Q How many bits were in each of these registers?

A Four bits per register.

Q In the 15 subroutines that we went through a moment ago, did each subroutine have a name by which it was referred to in the self-word listing?

A Yes.

Q Why don't we go through the subroutines and have you identify each subroutine by number and give the name it was referred to within the self-word listing?

A (Reading) Subroutine 1 is RPOOP. Subroutine 2 is DLY. Subroutine 3 is S-O-L-E-N.

Subroutine 4 is MATCH, M-A-T-C-H. Subroutine 5 is G-M-I-N-C.

Subroutine 6 is I-X-O-P. Subroutine 7 is LOOP, L-O-O-P.

Subroutine 8 is SB1. Subroutine 9 is KCH.

Subroutine 10 is SB2. Subroutine 11 is V-E-C-T-R.

Subroutine 12 is SSHOT. Subroutine 13 is SCT.

Subroutine 14 is SCH and subroutine 15 is SCK.

Q Were the contents of any of the registers 0 through 15 for the accumulator initially set prior to program execution?

A I am sure they were. I don't recall the specifics.

I would have to review the documentation to determine that.

MR. GOLDENBERG: May I have a few minutes?

(Discussion held off the record.)

BY MR. LEACH:

Q During execution of the program, can you identify where control would first be transferred to the sixth subroutine?

A The sixth subroutine being IXOP?

Q Yes.

A Location 238.

Q What was accomplished by statement number 6 on Exhibit 20?

A That bypassed the first two instructions of the subroutine IXOP.

Those first two instructions incremented the contents of register 2 and loaded register 2 into the accumulator.

The intent of instruction six was to bypass those steps which prepared the accumulator for operation by subsequent statements within the subroutine IXOP. That is, those statements number three through the end of the subroutine.

Because at the time the subroutine was called from location six the accumulator had already previously been loaded by information that should have been operated

on within the rest of the subroutine.

Q How did the program go about sensing the playfield switches?

MR. KATZ: Enter an objection to this question as being indefinite.

A That logic gets somewhat complicated. However, to try and summarize the logic involved with sensing of a switch, first of all, a bank of switches would be enabled.

BY MR. LEACH:

Q What do you mean by "a bank of switches"?

A A group of switches. Four switches to a group. Four groups of four switches, to the best of my recollection.

And if I can refer to the schematic, I can comfirm that.

MR. GOLDENBERG: Is that big drawing in the room?

A Yes.

(Discussion held off the record.)

BY MR. LEACH:

Q You are now looking at a drawing that has been previously marked as GD-56; is that correct?

A Yes.

A group of switches, eight switches per group would be enabled first. Then an individual switch within that group would be enabled.

Through various interface hardware, that switch

would be connected to the test input to the 4004 microprocessor.

The software would then test the status of that test input line and determine whether the switch was in an open or closed position by determining whether the sense of the test input was true or false. That is, a 1 or a 0.

Q Would the 11th subroutine identified as VECTR comprise the portion of the software that enabled the group of switches?

MR. KATZ: Objection to the question as being rather indefinite.

A No. The routine you have referred to was entered after the switch had been sensed or tested.

BY MR. LEACH:

Q What portion of the software was involved in enabling the group of switches?

A (Reading) The subroutines No. 1, RPOOP, No. 7, LOOP and No. 6, IXOP were involved in selecting and enabling an individual switch for sensing and for sensing the status of that switch.

In the subroutine LOOP the switch condition was sensed.

Q Was the signal received from the switches loaded into a register or the accumulator prior to it being connected to the test input of the 40004 microprocessor?

A No. The switch was essentially directly connected to the test input.

It would have taken -- The test input is this separate device from the registers or the accumulator.

Software instructions would be required to store the status of the test input into either a register or an accumulator.

Q How was it actually transferred to the test input? I noticed on the drawing there is a box labelled 9312.

MR. KATZ: Objection to the question as indefinite. There is no indication as to what you refer to as "it" in that question.

Could I hear the question back, please?

MR. LEACH: Let me ask another question. I will save some time.

BY MR. LEACH:

Q Did the device labelled as 9312, which is connected between the switches and the test input of the 4004, perform a function in connecting the switches to the test input?

A Yes. They performed that switching function.

The 9312 device referred to is controlled by lines shown on the bottom of that device, D1-2, D1-1, and D1-0 which are select commands which cause one of the inputs numbered 1 through 8 on the left hand side of that device, causing one of those inputs to be connected to the output

labelled at 15, which is then connected through a line to the test input to the 4004 labelled with a T.

Q What would the software do when a switch was determined to be closed?

A When a switch closure was detected within the software, the subroutine VECTR was entered, subroutine 11.

That subroutine would determine which switch was closed and would cause a transfer of control to another subroutine, an entry point onto 12 that we -- into subroutine 12 that we discussed earlier, SSHOT, which provided service functions for the various playfield switches.

And from there control would transfer to the score service routines, subroutines 13, 14 and 15, which we also previously discussed. (Reading)

And from there to logic labelled LRET on line 520. The logic on return after location 520 would then sequence through to the next switch for polling and action.

Q How were registers 6 through 9 used in the operation of the program in determining or sensing the status of the playfield switches?

A To the best of my recollection, they were not used in sensing the playfield switches. They were used to record whether various switches had been activated during a play, during the ball or the game for the purpose of illuminating a light associated with a switch.

For instance, associated with the E roll-over was a lamp which illuminated the letter E.

And when the E switch was activated, a bit in one of the registers 6 through 9 would have been changed from a zero status indicating the lamp would be off to a one status indicating that the lamp would be on.

Q How were registers 4 and 5 used in the operation of the program during the interrogation of the playfield switches?

A Registers 4 and 5 were used for the purpose of switch debouncing.

Register 4 would register -- would record the fact that a switch closure had taken place.

Register 5 would register the fact that all switches, all playfield switches were in an open condition. And both registers were keyed to major cycles through the program.

In other words, if switches were closed, register 4 would be incremented each time through the major loop of the program for as long as a switch, any switch on the playfield was closed.

And likewise, register 5 would be incremented each time through the major loop as long as all switches on the playfield were open.

Q When you say, "it would be incremented," what do

mean specifically?

A The contents of that register would be increased by one.

Q You mean one would be arithematically added to the binary number contained in the register?

A No.

Functionally that is what would take place and one would be -- the count in the register would be increased by one. The binary count would be increased by one.

It was a specific instruction called an increment instruction, which caused that function to take place.

Q Can you show an example of where register 4 was referenced in the self-word listing upon the detection of the switch closure?

A In Exhibit 20 the page containing instructions 258 through 325 in the upper right hand corner, the alpha numeric instructions which were incorporated into the program as a result of changes shown in the patch log, Exhibit 16.

Within those instructions the bottom instruction, INC 4, causes the contents of register 4 to be increased by one.

This routine containing this information, routine No. 11, VECTR, is entered whenever a switch closure is detected.

That entry comes from line 518. And right above that on line 516 is the instruction which provides for sensing the test switch.

Therefore, when that test condition is in a one state or true, when a switch is closed, instruction 518 is executed, which causes a jump to the routine VECTR at location 258 and under certain conditions will cause the incrementing of register 4 as previously described.

Q What has to happen before it will increment register 4?

A The logic shows testing of certain conditions of bit patterns within the accumulator.

I'd have to spend some time to review this documentation to determine what was in the accumulator at that time and what those bits meant.

Q Do you see instructions immediately preceding the increment instructions that involve loading the accumulator?

A Yes. There is an instruction that causes register 8 to be loaded into the accumulator.

The contents of register 8 are loaded into the accumulator and tested. I would have to review the documentation to determine what those bits which are being tested in an accumulator mean at that point. I don't believe there is existing notes on what those are.

Q Did you do that in your analysis that you performed a few months ago?

A I believe so.

It appears that the first bit that is tested is the game over bit in register 8. Register 8 contains game status flags which are also lamp indicators.

For instance, the game over bit would indicate that the game play had been completed. It would also indicate that the game over lamp would be illuminated on the machine.

Q Which bit was the game over with?

A That would be the most significant bit or bit 3, numbering bits from right to left, 0, 1, 2, 3. 3 being the most significant and 0 being the least significant in a binary representation.

I do not recall and I don't see in the notes in Exhibit 22-A through K what the other bits of that register meant referring to a test to instructions prior to the INC 4 instructions incrementing the contents of register 4 where another test of the contents of the accumulator appears, the accumulator contents being loaded from register 8.

It would be possible to determine what that bit represented, but that would take some analysis of the program.

Q How was register 5 used to indicate when a switch had opened?

A During the major loop of the program, register 4 was used to indicate the presence of any switch closure.

At the completion of that major loop register 4's contents were tested.

If register 4 was zero, it would indicate that there were no switch closures during that major loop where the switches were pulled. If no switch closure were detected, the contents of register 5 were incremented indicating that another cycle through the program had taken place or all switches were in an open case.

If a case closure was detected, that is, register 4 was nonzero, register 5 would be set to zero indicating that a switch closure had taken place during that polling sequence.

During the sequence of incrementing register 5 over a series of passes through the program, register 5 was incremented but never beyond the value of 15 octal.

That is, if 15 octal were incremented by one, it would be a zero within the 4 bit representation. So logic was included to detect that case and keep it at a large number. That is, 15, if such case occurred.

Q What would the program do if it was circling through and register 5 stayed at 15?

MR. KATZ: Objection to the question as hypothetical.

A The fact that register 15 -- register 5 continued to maintain a level of 15 would indicate that there were no switch closures and, therefore, no activity on the playfield. In that case, the game would essentially be in an idle mode.

The LED display and the playfield lamps would be maintained in the status that they were in prior to arriving at that value of 15 and the accumulator in register 5.

BY MR. LEACH:

Q Isn't it true that register 5 was set to zero when a switch closure was detected?

A Yes.

Q And register 5 was used to determine whether the switches had remained closed or not?

A Yes.

Q In each pass through the program that the switches remained closed, register 5 would again be incremented by one; is that not correct?

A No, that is not correct. Each pass through the program where all the switches remained open register 5 would be incremented by one.

If sequential passes through program detected a switch closure, register 5 would be reset to zero for each sequence where a switch closure was detected.

That is, if all passes through the program detected the switch closure, register 5 would remain at zero.

Q Why was register 5 incremented?

A To provide timing control for the purpose of allowing the game to respond to activation of switch closures.

The game -- The software required that after a switch closure, all switches must be detected in an open state for a certain period of time before subsequent switch closures would be acted upon.

Q Was that how debouncing was implemented in the program?

A Yes.

Q Where did the program test to determine whether all switches then remained open before it would proceed?

MR. KATZ: Excuse me. Could I hear that question again, please?

(Referred to testimony read by Reporter.)

MR. KATZ: Objection to the question as indefinite.

A On the page of Exhibit 20 showing instructions 258 through 235 beginning with instruction 259, register 5 is loaded into the accumulator and tested for a value of two or greater.

If register 5 upon entry at that point is two or greater, control is transferred to logic which causes a

response to the switch, a response being increasing of the score, illumination of the lights, activation of solenoids and various responses necessary to properly react to a light field switch closure.

BY MR. LEACH:

Q Do you mean it checked to see if there was a playfield closure that was missed? Is that right?

A No. At this point in the program a switch closure had already been detected.

This logic is determining whether that switch closure had previously been detected. That is done by stipulating that register 5 be two or greater indicating that two passes had been taken through the program where all switches had been open.

Now, if register 5 was less than two indicating that there had not been a duration of time equal to two passes through the program where all switches were open, that switch was not responded to in the normal manner and that switch closure was ignored except for recording the fact that it took place for purposes of monitoring registers 4 and 5.

The fact that a switch closure took place was registered in register 4 such that in subsequent statements in the program register 5 could be properly managed.

Q How would execution of the program proceed if you

were at statement 259 and the contents of register 5 was less than two?

A The test shown in the handwritten insert in the area of instruction 262, (reading) the JAN star + 4 test would fail. Control would transfer then to the next instruction, which is a JUNLRET, which is an unconditional transfer of control to location 520.

That transfer of control would bypass all of the switch logic, switch response logic associated with instructions 264 through 283 -- through 483.

Q What would the program do when control was transferred to statement No. 520?

A It would proceed to the next switch in the polling sequence and test that switch to see if it were closed.

Q If a switch got stuck, wouldn't the contents of register 5 always be less than two?

A Yes.

By a stuck switch, you mean a switch always in the closed position?

Q Yes.

A If a switch were stuck in the open position, that would not be true.

Q If a switch were stuck in the open position, it would never be detected; is that correct?

A Yes.

Q If a switch were stuck in the closed position, would the program always jump to statement No. 520 upon determining that the contents of register 5 were less than two and then go on to detect the next switch?

A I believe so. It would take some study of the program to verify that that is accurate in all cases, but I believe that is what would happen.

Q Can you identify this document (indicating)?

A This is a copy of a float chart of a version of the El Toro game software.

MR. KATZ: Objection to the question as lacking foundation and objection to the answer as being nonresponsive to the question and move to strike the answer because it did not respond to the question asked.

BY MR. LEACH:

Q The document I have just handed you to identify has been previously marked as Exhibit JD-52.

MR. LEACH: Let's have the Court Reporter mark that as Greg Cox Exhibit No. 26.

(Document produced and marked Greg Cox Exhibit No. 26.)

BY MR. LEACH:

Q Do you know what version of the El Toro software this float chart is intended to represent?

MR. KATZ: I object to the question as lacking

foundation that he is familiar with this document. I object to the question as calling for speculation about this document until a foundation is established.

I object to this question as calling for this witness to give you an opinion now on something without any indication that he is familiar with this document.

MR. NOVAK: Would it not be reasonable to deal with some of the matters raised which sound like normal matters in a deposition?

MR. GOLDENBERG: The witness identified the document.

MR. KATZ: He identified what he views were the contents of the document. He did not identify the document. You don't know who prepared it, you don't know when it was prepared. All of the basic foundational questions are missing.

You could have put any document in front of him and he might think he sees one thing or another.

Maybe he prepared the document. Maybe he didn't. I don't know and the record doesn't show it and it is unfair to anyone who reads this record to present that kind of a factual situation or allegedly factual situation.

It is tricky. And you know better, Mr. Leach, and I wish you wouldn't do that.

MR. LEACH: Mr. Katz, I am not trying to trick the

witness. I am just asking if he knows what version --

MR. KATZ: The trick is not on the witness. The trick may be on someone else.

MR. LEACH: Let me finish. I didn't interrupt you when you were making your speech.

I am just asking the witness if he knows what version of the software this float chart is intended to represent.

MR. KATZ: I repeat my objection.

A Let's first establish what this document is.

This is a document -- Exhibit 26 is a document which is a copy of a document prepared during my employment with Cyan Engineering.

This is a float chart -- This is a copy of a float chart I prepared in the development of the El Toro software. I do not specifically know which version of the program is described by this float chart.

MR. LEACH: Let's mark this as an exhibit.

(Document produced and marked Greg Cox Exhibit No. 27.)

BY MR. LEACH:

Q I am handing you now a document that has been marked as Greg Cox Exhibit No. 27 and has previously been marked as Exhibit GD-53.

Can you identify this document (indicating)?

A This document includes five pages which may or may not be related.

The first page appears to be a hexadecimal listing of the contents of memory of the program.

MR. KATZ: Objection to the question as lacking foundation. Objection to the answer as being nonresponsive to the question. That is with respect to identification of the document rather than the identification of the contents of the document or giving an opinion on the contents of the document without establishing a foundation for familiarity with the document itself.

A Page one has some handwriting in the upper right hand corner, which I recognize as my own. It says, (reading) pinball 1-F hex.

It is the hexadecimal dump of memory of some program which I don't recognize. It may or may not be associated with the El Toro pinball game.

BY MR. LEACH:

Q Is this a memory dump from the INTELLEC 4 system?

A Yes.

Q And that is the INTELLEC 4 system that was at Cyan Engineering?

MR. KATZ: I object to that question as lacking foundation.

A I believe so.

The rest of the document is also a dump of memory locations. To the best of my recollection, this was the format of data read out from a programmed 1702 programmable read only memory as read out through the INTELLEC system.

The notations on these pages indicate that these are the contents of four memory areas indicated as read only memory areas zero, one, two and three. Other than that, I can't identify them.

BY MR. LEACH:

Q Did you ever perform a memory dump during the development of the El Toro microprocessor controlled pin-ball game?

A Yes.

Q Did you perform more than one memory dump?

A Yes.

Q Do you recall approximately how many memory dumps you performed?

A No. But there would have been many. One dozen, two dozen. Some number larger than three or four.

MR. LEACH: I don't have any further questions.

MR. GOLDENBERG: Why don't we adjourn for lunch?

(A recess was taken for lunch.)

AFTER LUNCH RECESS

CROSS-EXAMINATION

BY MR. GOLDENBERG:

Q Mr. Cox, at the time you gave your affidavit in this matter, which is Exhibit 23, you stated you were employed by Kuras, K-u-r-a-s hyphen Alterman, A-l-t-e-r-m-a-n Corporation?

A Yes.

Q And in what capacity were you employed by that company, sir?

A I was employed as an advanced systems engineer.

Q What was the business of that company?

A Military electronic systems.

Q Can you be a little bit more specific without getting into security matters?

A Receiving and jamming systems covering the microwave frequencies used by radars.

Q What were your duties as an advanced systems engineer?

A System concepts, development, systems analysis and marketing types work relating to development of new product ideas and new technologies.

Q Did you yourself engage in circuit design or development?

A No, I did not.

Q Let's back up a bit, sir, and give me your education after high school if any, what institutions you went to, what degree you got and what year you got it?

A I have a Bachelor's Degree in mathematics from San Jose State University in San Jose, California, granted in June of 1970.

Q You joined Cyan Engineering in March of 1974, is that correct, sir?

A Yes.

Q Did you have any jobs prior to that time and subsequent to your getting a degree from San Jose State?

A Yes, I did.

Q Could you tell me what they were?

A From January of 1967 through November of 1970 I was employed by Lockheed Missiles & Space Company as a computer programmer.

From November of 1970 to November of 1973 I was employed by Dalmo Victor, D-a-l-m-o V-i-c-t-o-r as a programmer.

From November of 1973 to February of 1974 I was employed as a computer programmer by Ampex Corporation in Sunnyvale, California.

I left Ampex at the end of February and joined Cyan immediately thereafter.

MR. KATZ: Excuse me. Could I have his last answer back?

(Referred to testimony read by Reporter.)

BY MR. GOLDENBERG:

Q What kind of computers were you programming when you were with Lockheed?

A Various types of computers ranging from medium to moderately small sized computers up through very, very large scale computers. Univac 1108 and Sigma 5 and Sigma 7 were the principal computers that I programmed.

Q How about at Dalmo Victor?

A Programming there was on minicomputers and specialized processors that went into airborne military systems. These airborne processors fit somewhere between microprocessors and minicomputers.

They tended to have the computational power of a minicomputer without the peripherals in memory capacity and general purpose features you find in the minicomputer.

Q Now, while you were with Ampex, what kind of computers did you program?

A Minicomputers, data general eclipse type minicomputers.

Q What was the first encounter or experience you had with microprocessors or microcomputers?

A Oh, for a period of time prior to my employment at Cyan Engineering I had read trade journals and monitored the development in a very casual manner of microprocessor technology, and my direct involvement with microprocessors began with my employment at Cyan Engineering.

Q Were you employed specifically for the purpose of programming microprocessor computers?

A Yes.

Q Prior to your employment did you have an interview or interviews with anybody?

A Yes.

Q With whom, sir?

A Steve Mayer.

Q Anyone else?

A I believe I spoke with Larry Emmons also.

Q Where were those interviews?

A At the Cyan facility in Grass Valley.

Q Did you go there at their invitation?

A No, I did not.

Q How did the interviews come about?

A I looked in the phone book for companies that did electronics work and went and knocked on their door. They happened to be in and willing to talk to me.

Q So I take it during that period you were talking to several other companies as well or at least trying to?

A Yes. I spoke with one other company in the Grass Valley area.

Q Did you call and arrange the interview? Or did you just drive up to Grass Valley and --

A I drove up to Grass Valley and while I was there,

I was looking at real estate. And one of the real estate agents referred me to several companies, and I used those referrals in conjunction with telephone listings and I called Cyan Engineering and they were willing to speak with me.

Q And all that happened the same day?

A Yes.

Q Would it be proper to say that perhaps the determining factor in your mind was the location? You were interested in working in that part of the country?

A Yes.

Q And on that day you had this interview with Mr. Mayer, Steve Mayer, and perhaps Larry Emmons?

A Yes.

Q Was there more than one interview, or did you make a deal that day?

A There was that single interview and several subsequent telephone calls. To the best of my recollection, that was the only interview that took place.

Q What was the time lapse between the interview and when you started to work approximately?

A About three weeks.

Q What was the substance of those subsequent telephone conversations if you remember?

A They dealt with the specifics of a job offer,

salary, specific title, duties, things of that sort. Starting date, company benefits.

Q At the time of the interview did Mr. Mayer tell you the business of Cyan Engineering?

A He said they were involved in the design and fabrication of electromechanical and video games, which was the only detail he went into regarding their business.

Q Well, when he said, "electromechanical games," did he give you any idea what kind of games?

A No.

Q Would it be correct, sir, that you reported for work on or about March 4, 1974?

A Yes.

Q Do you remember what day of the week that was? Was that a Monday?

A It was a Monday to the best of my recollection.

Q Did you sign any kind of an agreement, employment agreement with Cyan Engineering?

A Yes, I did.

Q When did you do that, sir?

A I don't recall for certain, but it was probably within the first week of my employment there. Possibly on the first few days.

Q Now, before you were hired and before you accepted the job, were you told what the job would be, what you would

be doing?

A The only information I was given on the job to the best of my recollection was that my duties would be applying microprocessors to games, and my specific duties would be for developing the software for those microprocessor applications.

Q You would have no responsibility for developing hardware?

A That's correct.

Q Now, you had never programmed for microprocessors up to that point; is that correct, sir?

A Yes.

Q Apart from this experience -- and I approached that to some degree -- was that at Dalmo Victor?

A Yes.

Q I think you called it specialized processors?

A (Nods affirmatively.)

Q How were you qualified to do that then, sir, at that time?

A The specialized processors that I was programming at Dalmo Victor were similar to microprocessors in that they were programmed with machine code and assembly language instructions, those instructions being quite similar in nature to the instructions that is used in microprocessors.

And due to the nature of my work at Dalmo Victor, I had gotten a reasonably -- reasonably good familiarity with digital logic and control circuits and how they worked and how they were implemented. And I understood the implementation of the special processors quite well.

That technology related quite closely to microprocessors at that time.

Q Well, were you told, sir, prior to your employment how they were going to use microprocessors, what they were going to do with them?

A As best I can recall, Steve and Larry mentioned that they intended to imbed microprocessors in various types of games to provide the control functions for those games. They were nonspecific as to the specific types of games.

Q Did they give you any idea what the inputs to these microprocessors would be?

MR. KATZ: Objection to the question as indefinite.

A I don't recall.

I would -- We had a fairly lengthy technical discussion during the interview for a period of maybe one to two hours where Steve Mayer and Larry Emmons were trying to develop an understanding of my technical background and how it related to their task of implementing microprocessors. And we talked about my experience with hardware interfaces to processors that I was familiar with.

And I suspect that they used the basis of those discussions to determine my qualifications regarding their specific applications.

MR. KATZ: Objection to the question and objection to the answer as nonresponsive and speculative.

BY MR. GOLDENBERG:

Q All right, sir. With respect to your experience prior to joining Cyan Engineering, had you had any experience where inputs to microprocessors were switch closures?

A I had had no experience with microprocessors prior to my employment.

Q I am sorry. You are quite right.

Inputs to computers of any kind were switch closures?

A Yes, I did.

Q Could you tell me the nature and extent of that experience?

A In several of the systems that I prepared software for the system had a control unit which had a push button switch, multiple push button switches which were activated by the operators of the system.

These switches were connected through hardware interconnections to something very similar to the test input to the 4004, these inputs being called sense lines, s-e-n-s-e in the applications where the software would poll

the line to determine whether it was in an open or closed state.

Q And then if it determined which state it was in, it would take some kind of action in response to that input, whatever it may have been?

A That's right. It would change operating modes of the software, perform special functions.

Q And it might conceivably output to something to perform some kind of mechanical function or operation?

A No. There were no outputs to mechanical operations. All of the operations which I had had experience with were electrical in nature.

Q Well, would they activate displays and respond to a switch closure?

A Yes. There were certain modes where a small cathode ray tube in the system would be affected by switch closures.

Operator controls through the switches would modify the presentation of information on the CRT display.

Q And this modification would be the result of the programs stored in the computer?

A That's right.

Q Were any of these switches in your prior experience, sir, prior to Cyan connected in a metrics arrangement?

A No, they were not.

Q Why was that?

MR. KATZ: Object to the question as lacking foundation and calling for pure speculation.

BY MR. GOLDENBERG:

Q If you know, sir?

A I don't know why they were not connected in a metrics arrangement.

Q You don't know.

Were they a relatively small number of switches?

A Yes.

Q And you would only use metrics when you were dealing with, say, a large number of switches?

MR. KATZ: I object to the question as calling for an opinion of this witness without establishing --

MR. GOLDENBERG: Really, I ask very little of you. Let me finish.

I am sorry. I will have to have the question read back.

(Referred to testimony read by Reporter.)

BY MR. GOLDENBERG:

Q Based on your experience, sir, and if you know, would a metrics arrangement be used to connect switches only when you are dealing with a relatively large number of switches?

MR. KATZ: I object to the question as calling

for an opinion of this witness without having established that this man had ever formed an opinion in the past on that subject.

BY MR. GOLDENBERG:

Q Could you answer?

A The application of a metrics polling sequence for switches is very much dependent on the design objectives of the hardware designer, and I wasn't a hardware designer. And I had no direct experience in determining what type of switching arrangement would be best for various applications.

All I can speak from is direct knowledge that in the case of the systems I had experience with prior to employment at Cyan Engineering, they did not use a switch metrics.

It was used at Cyan Engineering and the number of switches was not greatly different. Certainly within a two to one factor.

So I think that those tradeoffs as to which switching arrangement is used are very much dependent upon the specific application.

Q Had you ever heard of a metrics prior to your joining Cyan Engineering?

A Yes.

MR. KATZ: Objection to the question as being indefinite.

A Yes. I had heard of a metrics.

BY MR. GOLDENBERG:

Q And in what context, sir?

A In a mathematical context referring to VECTR algebra and VECTR equations.

Q Had you ever heard of a metrics in connection with an electrical or electronic circuit design?

A Not that I recall. I am not certain. I don't believe so.

Q You said that prior to joining Cyan Engineering that you had read trade journals and monitored trade journals with respect to the microprocessors; is that correct, sir?

A Yes.

Q To the extent that you can recall prior to your joining Cyan Engineering, what was your understanding of the microprocessor or microcomputer?

A Based upon information I read, early versions of microprocessors were basically expanded versions of calculator chips which provided a basic computer capability with very restricted and limited general purpose applications, which would be programmed to provide numerical control sequences and perform limited analytical type functions. That upon the initial applications of these types of devices, their potential was accomplished and a divergence in terms

of technology took place that it was a conscious development of a general purpose microprocessor as distinguished from glorified calculator chips. And that these new generation microprocessors were just becoming available in initial quantities at the time I was employed by Cyan Engineering.

That there was a great deal of published information regarding the developments of various semi-conductor companies in this regard but actually, microprocessor hardware was still quite limited at that point.

MR. KATZ: I object to the answer and move to strike it as being nonresponsive and speculative and lacking in foundation.

BY MR. GOLDENBERG:

Q I take it, sir, that the answer you just gave me was based on your reading of the technical literature of that time?

A Yes.

Q You thought you understood the literature at that time, did you not?

A Yes.

Q Now, you characterize them as initially glorified calculator chips. I think that is your phrase?

A Yes.

Q Were you familiar with calculator chips in the period prior to joining Cyan Engineering?

MR. KATZ: I am objecting to the question as indefinite as to what you mean by "familiar."

A Basically I wasn't familiar with them. I probably knew more about microprocessors at that point than I did about calculator chips, because there was not much published information regarding the calculator integrated circuits.

BY MR. GOLDENBERG:

Q They were specialized circuits, were they not, sir, from one company to another? Isn't that correct, calculator chips?

A Calculator. I believe so, yes.

Q Not general purpose chips to your knowledge?

A That's correct.

Q Did you know how calculator chips were connected up in the calculator to perform some kind of useful function?

A No, I did not.

Q When you joined Cyan Engineering, what was the first assignment that you were given, sir?

A The El Toro pinball game software, to the best of my recollection.

Q Now, at the time you joined Cyan Engineering and were given the assignment of preparing the software for the El Toro pinball, had any work on the software been attempted prior to your joining the company?

A I am not certain.

I remember Steve Mayer having some segments of a program which he had written and he asked me to review.

I don't -- I don't know if they related to a pinball game development or another application.

Let's rephrase that. I don't recall and I am not certain that I knew at the time what the application of that software was.

Q At the time you joined Cyan Engineering, sir, had any hardware design been done on the El Toro game, if you know?

MR. KATZ: I object to the question as being indefinite as to what is meant by "hardware design."

BY MR. GOLDENBERG:

Q Do you know what I mean by "hardware design," sir?

A By hardware design, I would interpret that to mean the development of schematics and circuit diagrams for --

Q To any degree, sir?

A I am not certain. Memory is not very clear on the subject. But I believe that Steve Mayer at least had done some preliminary hardware design prior to my employment within the company.

Q Were you shown any schematics in the early days of

your employment?

A I don't recall.

Q Did Mr. Mayer sit with you and tell you what he wanted you to do?

A Yes.

Q Did he explain the pinball game to you?

A Yes.

Q Was it necessary for him to do that? Had you ever encountered a pinball game before?

A I had played pinball machines. That is the extent of my knowledge on them at the time I joined the company.

Q Did Mr. Mayer seem to know what he was talking about to your understanding?

A Relative to the subject of developing a microprocessor control system for a pinball machine, he seemed to be knowledgeable on what that task entailed, how to go about it.

Q And did he provide you with instructions, sir, as to what you were to do?

A Of a general nature. During the early phases of the program, there were continued discussions and design refinements based on discussions between myself and Steve Mayer relating to hardware and software implementation.

I lost my train of thought. Could you repeat the question and answer?

MR. GOLDENBERG: Perhaps if you just read the question and the witness's answer as far as it went.

(Referred to testimony read by Reporter.)

A The instructions were pretty much limited to developing a software system for the El Toro game. They were very general in nature.

And we worked rather closely together in developing the basic input/output structure and control sequence structure of the hardware at an architectural level from which I proceeded to develop the software.

BY MR. GOLDENBERG:

Q Did he tell you what the inputs would be?

A Yes.

Q And could you tell me what he told you in that respect as you recall now?

A The inputs would be various electronic signals provided to the ROM input ports and the test input ports to the microprocessor.

We had discussions upon what those specific signals would be that were connected to those input ports.

Q Did he tell you what the source of these signals would be?

A Yes.

Q What source did he tell you?

A Playfield switches.

Q Coin switch?

A Coin switch.

Q Tilt?

A Tilt. The various sensing switches throughout the machine.

Q Did he tell you what the outputs would be?

A Yes.

Q What did he tell you in that respect?

A The outputs would be via the ROM output ports, and they would be digital control signals to the LED displays to the solenoid activation circuits to the lamp illumination circuits.

Q Was there an El Toro game on the Cyan premises at the time you joined the company?

A I'm not certain. I don't recall for sure whether it was present when I started work there or not.

Q Do you recall it coming onto the premises after you started there?

A No.

Q While Mr. Mayer was making these general instructions to you about inputs and outputs, do you recall whether or not you were standing and looking at a game as he was making these explanations?

A These discussions would have been held probably at least several weeks after I joined the company, and at

the time they took place I believe there was an El Toro game present.

Q What happened between your point of initial employment and this several weeks before you got these general instructions?

A I was given a set of manuals for the 4004 microprocessor, for the INTELLEC MCS-4 system. I was given a programmer's guide. I was given instructions to become familiar with programming techniques, how to program them.

I believe we took delivery of the INTELLEC MCS-4 system very shortly after I began work there.

And one of my early tasks was to help bring that system to a running -- up and running condition and to develop some support software for various aspects of the device.

One of these that I recall was some software for enhancing the PROM programming, PROM P-R-O-M programming capabilities of the machine.

So during the first several weeks, I was becoming familiar with the INTELLEC system and its use.

Q Did you find that a difficult task?

A No, I did not.

Q Were you able to complete those tasks, becoming familiar with the INTELLEC 4 and providing this support software?

A Yes.

Q Now, you said earlier that Mr. Mayer had given you some software that he had prepared, you weren't sure what it was for.

Was that during these initial weeks when you were going through what we might call this familiarization period?

A Yes, it was.

It was probably during the first week, because I recall it happening very shortly after I began employment.

Q Did Mr. Mayer tell you at that time that this was a program or part of a program that he had written?

A Yes, he did.

Q Did you test or examine that program in any way?

A I believe I examined it at a desk switch actually inspecting it and trying to understand it. But I didn't test it on a computer in any way.

Q All right.

Do you think you understood it?

A I don't recall.

Q Did you form an impression at that time as to whether or not Mr. Mayer knew what he was about insofar as that program was concerned?

MR. KATZ: Excuse me.

Can I hear that question read back?

(Referred to testimony read by Reporter.)

MR. KATZ: I object to the question as indefinite and meaningless as to what he was about.

BY MR. GOLDENBERG:

Q That is a colloquialism.

Do you understand that phrase, "what he was"?

A I interpret it a certain way. I interpret it to mean do I have an opinion as to whether he thought he was proficient at programming.

Q All right. Let's have that interpretation.

A My recollection was that the program I reviewed showed a very strong lack of experience on the part of the programmer -- in this case, Steve Mayer -- and that although it may work, it was certainly not the best way to accomplish what he was trying to do.

Q In your initial phase, your first several weeks with Cyan, sir, did you form any impression as to Mr. Mayer's technical abilities?

A Yes, I did.

Q Could you tell me what that impression was?

A In general, I thought he had a very excellent grasp of the technology he was dealing with, that he was a very innovative and creative electronics engineer.

Q During that period, sir, did you form an impression as to whether or not he understood what microprocessors were or microcomputers and how they worked?

MR. KATZ: I object to the question as lacking foundation for any such impression.

A That's a difficult question to answer because of my lack of experience with microprocessors.

Anybody that showed any knowledge at all would have impressed me.

BY MR. GOLDENBERG:

Q Did Mr. Mayer show any knowledge at all?

A He showed more knowledge than I had, yes.

Q Did there ever come a time when you formed any impression about his understanding of microprocessors and how they worked, sir?

A Yes. By the time we had completed this project, I felt he had a good grasp as to the applications of microprocessors, yes.

Q And by "this project," you are referring to the El Toro project?

A Yes.

Q Is it correct, sir, that you yourself did not do any of the hardware design on the El Toro project?

A That's true.

Q You became familiar with that hardware design, though?

A Yes.

Q So you had to become familiar with that hardware

design to some degree to do your work, did you not?

A Absolutely.

Q How did you gain your familiarity to whatever degree you had it of the hardware design?

A Discussions with Steve Mayer and review of the designs and schematics for the electronics.

Q When you say "review of the schematics," you mean actually studying the schematics yourself?

A Yes, with Steve Mayer's assistance.

Q With Steve Mayer's assistance.

Anybody else?

A I don't recall specifically, but it would not be improbable to have had conversations with Mike Rodgers or Ed Schleeter or Ron Milner regarding specific components and their operations or specific circuits and their operations.

Q These gentlemen that you just named. These were all employees of Cyan Engineering, were they not?

A Yes.

Q In the course of writing the software for the El Toro project, did you ever receive any help from Mr. Mayer or anyone else at Cyan Engineering?

MR. KATZ: Objection to the question as indefinite and overly general.

A I had periodic consultations with Steve Mayer

regarding the implementation of the electronics and the software.

Do you mean help in terms of designing the software or writing the program or testing the program?

BY MR. GOLDENBERG:

Q Well, let's take those in order, sir. Let's say in designing the software?

A I was solely responsible for the design and implementation of the software.

During the testing phase where we were debugging the software and evaluating its performance on the pinball machine, the El Toro pinball machine, I had Steve Mayer's assistance in operating the hardware and the electronics to perform such testing.

Q How was the software for the El Toro game first tested?

A Various portions of the software were tested independently.

The program was written in certain logic loops or logic functions were tested individually.

For instance, controlling the LED displays and these individual functions would have been tested one at a time.

Most of these could be done without a significant amount of hardware involvement. In other words, implementing

the hardware and the software, putting them together in the microprocessor, interpreting the microprocessor to the electronics in the El Toro game and triggering switches with finger or rolling the ball over. Testing would -- was of that nature.

Q Do you recall any testing, sir, where a board with switches on it was built up and the board with lamps built up and then the processors connected in between?

A I hadn't until you mentioned it, but that circuit board you described does sound very familiar.

I can't -- I don't remember the specifics of its development or its use, but I remember a board of that nature sometime during the time I was at Cyan Engineering.

Q Do you recall, sir, whether or not any of the software testing used such a board?

A I don't -- I am not certain but could be.

Q Do you recall, sir, how the switches, lamps were connected on this board?

A No.

Q Weren't they connected in the metrics?

A I don't remember.

Do you mean a board that had basically representations of the El Toro game on it rather than being connected to the --

Q Well sir, I am trying to have your memory and --

A Yes. I don't recall. I don't remember.

Q Was there a board which was a representation of the El Toro game?

A I don't recall.

Q Approximately when did you complete the work on the software for the El Toro game?

A I am not certain. I believe it was probably in late May, early June of 1974.

Q Prior to this open house about which we have been talking?

A To the best of my recollection, yes.

Q Just prior to it or what? Your best recollection, that is all.

A Within several weeks prior.

Q Several weeks prior.

So it might have been early May?

A Might have been.

Q More than likely if it was several weeks, the open house was the latter part of May, it would have been early May perhaps or --

A I don't have a specific recollection when the open house took place.

My recollection was that it was sometime in the June time frame, but I don't know how accurate that is.

Q But in any case, the software was completed

several weeks prior to the open house?

A To the best of my recollection, yes.

Q During the period that you were working on the El Toro software, were you working on any other tasks?

A I believe that some of the work on the software for supporting the MCS-4 system was done during the time I was preparing the El Toro program.

And it is also very likely that I was doing some work on another project right at the end of the El Toro software development phase.

Q Tell me what that other project was, sir.

A It was a -- It is a little box with switches and LED's that would allow the operator to play blackjack, craps.

Q And that was microprocessor controlled?

A Yes.

Q And it too was to use the MCS-4 system?

A Yes.

Q During this period, sir, was there only one MCS-4 system on Cyan's premises to your knowledge?

A Yes.

Q Were there any microprocessor chips by themselves on the premises to your knowledge prior to your open house?

A I don't recall.

Q Was this other project completed, the box with LED's so that you could play -- did you say -- blackjack and what

else?

A Blackjack, craps. There were several other games. There were four games total. I don't remember what the other two were.

Q Was that completed during your employment with Cyan Engineering?

A Yes.

Q Was that ever built?

A I don't know.

Q Well, I asked if you completed it and you said you completed it, sir. What do you mean by "completed"?

A A working prototype that functioned according to certain objectives established before the project was undertaken.

Q It played the four games, whatever those four games might have been?

A Yes.

Q And it too was controlled by the MCS-4?

A Yes.

Q Well, when somebody was working on the box -- and can I call that the game box -- when somebody was working on the game box --

A (Nods affirmatively.)

Q -- did they have to disconnect the MCS-4 from the El Toro and hook it up to the game box?

A If -- If both games were to be played on the same day, for instance, you would have to disconnect the MCS-4 from one and connect it to the other, yes.

Q Was that a difficult task?

A No.

Q How did you do that? How was that done?

A There is what is called a ribbon cable, a thin flat cable which came from -- came out from the MCS-4 and was connected to the circuit card through a connector.

All you had to do to connect the MCS-4 to a different machine was disconnect this particular ribbon cable and connect it to the other device.

Q And that would be true of connecting it to the El Toro, that you simply take this ribbon cable and make this mechanical connection to the circuit board and the El Toro game; is that right?

A Yes.

Q In the El Toro game was the circuit board inside the cabinet or outside the cabinet? Do you recall, sir?

A I believe it was outside the cabinet.

Q Did you ever see it inside the cabinet?

A I don't recall.

Q Are you sure of that?

A I am sure I don't recall.

Q Was there more than one pinball game on Cyan's

premises during your period of employment with that company?

A I believe that during the last few weeks of my employment, there was another pinball machine which was brought onto the facilities.

I can't recall the specifics of exactly when or what type of a machine it was.

Q And you left on or about August 16th, 1974; is that correct?

A Yes.

Q Did you know the purpose of having this other pinball game on the premises?

A To the best of my recollection, I was never told the purpose of it, no.

Q You thereafter did no work in connection with this other game?

A No, I didn't.

Q Do you recall the manufacturer of the other game?

A No, I don't.

Q Do you recall the name of the game?

A I don't recall the name of the game from my involvement at Cyan at that time. I was told by another individual subsequently what that machine was, but I don't recall from firsthand knowledge what it was.

Q Who was that other individual that told you that?

A Mr. Schnayer.

Q What did he tell you?

MR. KATZ: I object to the question and would like to impose an objection here and ask and request that the witness not reveal information that took place in connection with our consulting arrangement with him.

MR. GOLDENBERG: On what basis, sir?

MR. KATZ: Under the federal rule that deals with consultants retained by attorneys.

MR. GOLDENBERG: Could you quote that rule to me?

MR. KATZ: I don't have a rule book with me.

MR. GOLDENBERG: There is no such rule.

MR. KATZ: I say there is.

BY MR. GOLDENBERG:

Q Could you tell me, what was the name that Mr. Schnayer gave you?

MR. KATZ: If we can get a federal rule book, I will find it.

Do you have a Federal Rules of Civil Procedure? I think it is under Rule 26.

(A brief recess was taken.)

AFTER RECESS

MR. KATZ: My objection is based on Rule 26 of the Federal Rules of Civil Procedure which covers scope of discovery.

This is Rule 26B(3) for trial preparation and

materials. And it says, (reading) subject to the provisions of subdivision before this rule, a party may obtain discovery of documents and tangible things, et cetera, and it goes on and so on . . . prepared in anticipation of litigation or for trial by or for another party or by or for that other party's representative, which includes his attorney, consultant, surety, indemnity, agent only -- and it says only upon a showing that the parties seeking discovery has substantial need of the materials in the preparation of his case and that he is unable without due hardship to obtain the substantial equivalent of the materials by other means.

However, the rule goes on to say that even when the Court orders discovery of such material -- and there hasn't been such order even or any such motion in this case -- that even when the Court orders discovery of such materials when the required showing has been made, the Court still shall be protected against disclosure of the mental impressions, conclusions, opinions or legal theories of an attorney or other representative of a party concerning the litigation.

And it is our position that information that was disclosed by Mr. Schnayer in this regard relating to the case, which is pure hearsay anyway to this witness, is the mental impressions and opinions, conclusions of Mr. Schnayer.

And while Mr. Cox was in the employ of this party, the plaintiff, that those things are protected under this rule. And I request -- I strenuously request Mr. Cox not to disclose this information.

MR. GOLDENBERG: Make your objection and let's get on with it.

MR. LEACH: That rule only deals with documents and other tangible things.

MR. KATZ: The last part that I quoted is not limited to the documents.

MR. LEACH: The last part you were talking about is limited to application to the first part, which is limited to documents.

MR. GOLDENBERG: Mr. Katz, you are clearly distorting the language of the rule, but the purpose of this rule -- this gentleman was called as a fact witness by us.

Now, you have retained him as a consultant for your own mysterious reasons.

MR. KATZ: For connection with trial to understand some of these things about the El Toro.

And we have been good enough to permit you to go into this inquiry, even though this material in his refreshed recollection was done at our expense.

MR. GOLDENBERG: My question of the witness is a factual question.

MR. KATZ: But it is pure hearsay.

MR. GOLDENBERG: Hearsay is not an objection at this point. You know that, sir.

Mr. Novak, I ask you to consider this very carefully because I tell you now that I have every intention of exploring every aspect of Mr. Cox's discussions with Mr. Schnayer, Mr. Katz, Mr. Welsh, anybody associated with the plaintiffs' attorneys in this matter. We feel we have every right to do so. There are no attorney-client relationships. This consultant thing we will deal with.

If I do carry it to the Judge in Harrisburg or the Judge in Chicago, they are going to let me inquire about it and I think you see, sir, that this rule that Mr. Katz has reference to has nothing to do with the situation we are faced with here. This is a fact witness and we are entitled to inquire into his knowledge of facts.

MR. KATZ: But he has already stated that he didn't have this knowledge of the facts but for disclosure just recently. We are talking about facts with respect to the time --

MR. GOLDENBERG: I tell you, sir, that our views of the facts is this witness made an ex parte affidavit, and we are entitled to go into the contents of that affidavit, the factual background upon which he relied to make the affidavit and, in addition to that, the circumstances

under which the affidavit was made.

MR. KATZ: If we limited this deposition to the affidavit, almost your entire inquiry up to the present time would have been excluded.

MR. GOLDENBERG: I don't think so.

MR. NOVAK: I agree with what you are saying. Certainly you have the right to inquire into the background that would form the basis of his knowledge. But your question is way outside of that, what Mr. Schnayer thought of the fact.

He stated already his knowledge that he didn't know what kind it was. If you want to interrogate Mr. Schnayer as to what he knew it to be, you may call Mr. Schnayer but not Mr. Cox.

MR. GOLDENBERG: This affidavit came into being and was filed in the case.

MR. NOVAK: He has already stated he didn't know.

MR. GOLDENBERG: I am entitled to go into all the circumstances surrounding the making of this affidavit.

MR. NOVAK: And that is in the affidavit and he has stated he didn't know it. He made no affidavit concerning it.

MR. GOLDENBERG: I think anything he said to Mr. Schnayer, anything he said to Mr. Katz, anything either one of those gentlemen said to him is something I am entitled

to know about and this record should show.

MR. NOVAK: If you felt that was the case, Mr. Goldenberg, you should have asked for discovery so you could sit in on every meeting that they had long ago.

MR. GOLDENBERG: In the first place I don't know every meeting that they have had long ago, but I am going to do my best to find out about them.

MR. NOVAK: You certainly have the right to know how many times they met and when and where.

MR. GOLDENBERG: And what they said to each other.

MR. NOVAK: I think there are some limits to that.

MR. GOLDENBERG: I don't think so.

I can only tell you that in this very same case on a slightly different basis this effort to protect conversations between a fact witness in this law firm was attempted to be protected by the assertion of an attorney-client privilege.

Judge Grady in this case refused to concede that there was such a privilege and held that the questions must be answered and indeed, his language -- and I will quote this as best I can -- in dealing with the matters said the whole thing had a slight odor about it.

MR. NOVAK: I don't even know what all this case is about. I was asked by Mr. Cox here to protect him and so I am not sure what his knowledge is at all and what it

has been in the past.

All I am saying is he has stated his knowledge and he stated the name was mentioned by Mr. Schnayer. He has stated he did not know that of his own knowledge.

MR. GOLDENBERG: I am entitled to know everything those two gentlemen said to each other. That is my position simple and clear.

MR. NOVAK: Your position is that you have the right to have, in effect, as verbatim as possible everything said between Mr. Cox and --

MR. GOLDENBERG: Yes, it is.

MR. NOVAK: That seems to be contrary to that rule.

MR. GOLDENBERG: I don't think that rule is set up so that any party can go to a third party fact witness, hire him as "a consultant" and by doing that limit the examination of that witness. I don't think so.

MR. NOVAK: I agree with you. That does not limit your examination one iota in regard to the facts.

MR. GOLDENBERG: Then let me ask the question.

That rule deals with the matter of retaining consultants and experts for trial.

MR. KATZ: It does not say that.

MR. GOLDENBERG: It does so.

MR. KATZ: That is Section 4 of the rule. I am

talking about subsection (3) of the rule.

Now, Mr. Goldenberg, you know as well as I do that --

MR. GOLDENBERG: Sir, you are interrupting my examination, you are delaying the completion of this witness and this is the tactic which we have had to face repeatedly and slapping your hands on the table isn't going to advance the matter one bit.

MR. KATZ: You know as well as I do that in the deposition that was taken of Mr. Holf -- remember Mr. Holf in this case, Ray Holf?

Your firm and Mr. Leach's firm were at that deposition. Mr. Harding was there and also Mr. Rifkin from your firm and they just both jointly represented Mr. Holf. Mr. Harding was there and Mr. Rifkin and they represented them jointly and they took the position that they could not inquire into anything with respect to the consulting relationship that existed between Ray Holf and your clients.

Both Williams and Gottlieb had, according to the testimony, retained Ray Holf as a consultant.

He was also a fact witness in connection with Ramtek* work, and we were not permitted to inquire into any communications between your firm, anybody from your firm or anybody from Mr. Leach's firm and Ray Holf.

*Spelled phonetically

And this was exactly the rule that was imposed, and no information was given to us.

And now of course when the situation or the shoe is on the other foot, you take a different interpretation.

MR. LEACH: I disagree with that characterization.

MR. KATZ: You should. I guess there is no other thing you can do but disagree with the characterization. But let me tell you that it is true.

A I would like to have a short recess at this point.

(A brief recess was taken after which a discussion was held off the record.)

AFTER RECESS

CROSS-EXAMINATION CONTINUED

BY MR. GOLDENBERG:

Q Mr. Cox, what was the name of the game that Mr. Schnayer told you came to Cyan Engineering shortly before you left in August of 1974?

MR. NOVAK: After a lengthy discussion both on and off the record, and after an extensive discussion of Rule 26, it seems to me that there is great dispute between counsel here and perhaps it is a matter that can only be dealt with by the Court to answer as to whether that type of information is accessible.

Certainly you are allowed to question into the background in the development of a declaration and an

affidavit. That does not seem to be going in that direction.

My response in regard to this is not to limit you in any way from inquiring into the credibility or the development of the matters which are the subject matter of this testimony; his recollection, his absolute recollection and the development of the affidavit and declaration.

But the dispute here seems to be one that I would have to instruct him not to answer until the Court reconciles what the obligations are here.

And I presume that you and Mr. Katz and Mr. Leach can present those arguments to the Court and the Court can decide that.

MR. GOLDENBERG: And we will, sir. I don't know that this question is all that important but the principle is. We will deal with it.

BY MR. GOLDENBERG:

Q After the open house, sir, did you do any further work on the El Toro game?

A I don't recall.

Q You don't recall whether you did or not? Is that what your answer is?

A Yes.

Q You might have done some work? Is that possible?

A That's possible.

Q If you didn't work on the El Toro game after the

open house, what did you work on?

A The game box that was previously mentioned and a -- another game.

Q What was the other game, sir?

A It was to be a flying game with a CRT providing a computer perspective of what a pilot might see in flight, a game controlled by a joist stick.

Q And with a microprocessor control?

A Yes.

Q Was your work once again writing the software for that game?

A Yes, it was.

Q Your present recollection. Is that what you worked on until your employment ended at Cyan?

A Yes.

Q Why did your employment end at Cyan, sir?

A The Atari Company was suffering some financial setbacks, as it was rumored to me, and all of the Cyan employees received a ten percent pay cut.

I was having difficulty meeting my financial obligations prior to my pay cut and afterwards it became impossible.

So I left the employ of the company to seek greener pastures that paid better.

Q What employment did you have next?

A I returned to Dalmo Victor where I had worked from 1970 to 1973.

Q And when did you join Dalmo Victor?

A In August of 1974.

Q How long were you with them, sir?

A Approximately three years.

Q Were you programming for Dalmo Victor?

A When I first went back to work for them, yes. I spent approximately six months programming, and activities after that were of a systems engineering and engineering management nature.

Q Again, this was in the general field of military electronics?

A Yes.

Q After Dalmo Victor, what did you do?

A In June of 1977 I went to work for General Instrument Corporation, their electronics systems division in Hicksville, New York.

Q In what capacity?

A As a systems engineer.

Q Working on what kind of devices?

A The same types of devices as I worked on at Dalmo Victor; military electronics.

Q And how long were you with General Instrument?

A Two years.

I left them in July of 1979.

Q And then where did you go to work, sir?

A I went to work for Kuras-Alterman, K-u-r-a-s Alterman, A-l-t-e-r-m-a-n.

Q And that is the company you were with in February of 1983?

A 1981?

Q I am sorry, 1981.

A Yes.

Q As a systems engineer?

A As an advanced systems engineer.

Q Advanced systems engineer.

In February of 1981, sir, what was your compensation on a monthly basis?

MR. KATZ: What year, 1981?

MR. GOLDENBERG: If I said 1971, I misspoke.

A Approximately $3400 a month.

BY MR. GOLDENBERG:

Q Was that for a 40 hour week?

A Yes.

Q Do you think approximately $25 an hour, is that correct, sir?

A $20 an hour would be more accurate.

Q Now, tell me the circumstances under which you were retained by Mr. Schnayer to be a consultant to his

law firm.

A I received a telephone call from Mr. Schnayer. He asked some general background questions relating to identifying me as the programmer on the El Toro pinball game at Cyan Engineering, which was developed in mid 1974, stated that his firm was involved in some legal actions of which the El Toro development had some relevance.

He did not state what that relevance was. And he asked if I would be willing to consult for them to provide technical information regarding the work I did while employed at Cyan Engineering working on the El Toro game.

Q Could you explain technical information concerning the work you did, sir? I am not sure I understand what you mean by that or what you understood Mr. Schnayer to mean by that.

A The implementation of the El Toro game in terms of its software and its operation and its features.

Q By that do you mean, sir, to explain the software, study it and explain it?

A Yes.

Q Anything else?

A Nothing other than general background of my relationship to Cyan Engineering and events that transpired during my employment there.

Q Were you to be paid for your time when you were telling them about your relationship with Cyan Engineering and events that occurred there as well?

A Yes.

Q So whether you were interpreting the software listing or giving them your recollection of events, you were going to paid for your time?

A Yes.

Q At the rate of $50 an hour at that time?

A Yes.

Q Who suggested the $50 an hour?

A I did.

Q Was there any discussion about the propriety of that amount?

A No.

Q It was accepted?

A Yes.

Q Do I understand correctly that you are now charging that law firm $75 an hour for your time?

A Yes.

Q Does that include your time for attendance at this deposition?

A Yes.

Q And the first session a week ago Friday as well?

A Yes.

Q Do you consider giving your time as to facts within your knowledge as acting as a consultant to Mr. Katz's law firm?

MR. KATZ: I object to the question as to whether he's ever formed any opinion at all about that before.

MR. GOLDENBERG: We will find out.

A At the time I was initially retained by Mr. Katz's firm, they told me that there may be further involvement, potential additional requirements for my time such as a deposition, such as trial testimony. These were all brought up as possibilities.

And part of the agreement was that they would compensate me for any of my personal time that had to be expended in these matters as a result of my consultation for them.

BY MR. GOLDENBERG:

Q Are you taking a day off for vacation or leave from your present job?

A Yes. I had to take vacation to come here today.

Q And that includes last Friday as well?

A Yes.

Q What is your hourly rate of pay now approximately?

A Approximately $22 an hour.

Q At whose suggestion was the consulting fee increased from $50 an hour to $75 an hour?

A At my suggestion.

Q Was there any discussion about that by Mr. Schnayer or Mr. Katz?

A I discussed it with them and they agreed to it.

Q They didn't raise any question about it?

A No.

Q Now, I think in response to a question from Mr. Leach last Friday you told him that prior to your testimony here you had a telephone conversation with Steve Mayer. Is that correct, sir?

A Yes. I had a telephone conversation with Steve Mayer.

Q Who initiated that telephone conversation?

A I did.

Q When did you do that, sir?

A Very shortly after I was initially contacted by Mr. Schnayer.

Q That would have been in February of 1981 approximately, around early in the year 1981?

A January or February, yes.

Q Why did you do that?

A Because I had no knowledge of any of these events, and Mr. Schnayer gave me a very cursory description of what these events were. And since it bore upon the work I had done at Cyan Engineering, I wanted to check with Steve Mayer

and verify that there was a legal proceeding underway and find out what Atari's position was with regard to that proceeding.

Q How long approximately was this telephone conversation with Steve Mayer?

A About three to five minutes.

Q What did Mr. Mayer say to you in the course of that conversation?

A Well, he said that there was a legal proceeding underway, provided no details on what those proceedings were, indicated that his firm, Atari, was not an active participant in that case.

He used the term that they were acting as friends of Gottlieb & Company.

We asked about each other's families. He said he was opening up a new facility in New York metropolitan area and asked me if I wanted a job. And that was about the extent of our conversation.

Q Did he say anything to you about these events which I think is the phrase you used earlier, sir?

A The events as they -- events that occurred during my employment at Cyan?

Q Yes, sir.

A No, he did not.

Q Did you ask any questions?

A No.

Well, obviously I asked him questions. I asked him if he was familiar with Mr. Schnayer's firm and the proceedings, and he said he was aware of their firm, that they were representing Bally and --

Q Did you ask him any questions about these events?

A No, I did not.

Q All right.

Now, you said that Mr. Schnayer gave you a cursory review of these events during a telephone conversation.

Isn't that what you said, sir?

A Yes.

Q What did Mr. Schnayer tell you?

MR. KATZ: I object to the question as indefinite in that I think the witness, when he used the term "these events" before was talking about these legal proceedings and not the events that transpired earlier.

MR. GOLDENBERG: Very clever but I don't think so.

MR. KATZ: Maybe you are right. I was confused.

BY MR. GOLDENBERG:

Q When you said "these events," you had reference to the events that you had been testifying about, sir, that is, the events during your period of employment with Cyan Engineering? Isn't that true?

A The first time I used that reference this afternoon

I believe that is true.

From now on maybe we should be more specific so that there is no misunderstanding.

Q But when you said Mr. Schnayer gave you a cursory review of these events, these events that you had reference to were events during the period of your employment with Cyan Engineering? Isn't that true?

A No.

What I meant was that Mr. Schnayer gave me a very cursory review.

MR. NOVAK: Mr. Mayer?

A Mr. Schnayer gave me a cursory review of how his firm was involved that would bring about a participation on my part, the fact that the work done at Cyan Engineering had relevance to legal proceedings that they were involved with.

BY MR. GOLDENBERG:

Q On the occasion of that telephone call, did he ask you your recollection of your period of employment at Cyan Engineering?

A To the -- I don't recall any specifics of that conversation. I think that about all we agreed upon was to meet and discuss it.

Q And was there a meeting?

A Subsequent to that phone call there was a meeting,

yes.

Q Where did that take place?

A In New Jersey.

Q When was that meeting?

A (Reading) February 18th.

Q And what exhibit are you looking at, sir?

A Nine.

Q Who was at that meeting?

A Just Mr. Schnayer and myself.

Q Was there a telephone conference the same day?

A Yes. In fact, I think that was probably our initial conversation.

Q So it was a telephone conference earlier in the day and then --

A Then he got on an airplane and came to New Jersey to talk.

Q And when was the consulting agreement reached, on the telephone conversation or the dinner conference?

A Telephone conversation.

Q I want as best you can recall everything you said to Mr. Schnayer and everything Mr. Schnayer said to you during that dinner conference.

A I don't recall the specifics of our conversation on that date.

The basic topics of our discussions are contained

in the affidavit labelled Exhibit 23.

He asked me to explain my involvement in the El Toro project at Cyan Engineering while I was employed there.

He asked for my dates of employment at Cyan Engineering.

Q You are looking at the affidavit now as Exhibit 23 as you gave your answer, aren't you?

A Yes. To refresh my memory as to the events that were of interest to Mr. Schnayer in that time frame.

He asked about the relationship between myself and various INTEL representatives.

He gave me copies of the computer programs, which we have labelled Exhibits 16 and 20. He gave me a copy of the programmer's manual, which we labelled as Exhibit 15.

Q Was it agreed in the telephone conversation which preceded the dinner meeting that he was going to bring these things with him?

A No, it was not. I did not know that he was bringing them.

Q I see. Go ahead.

A While we were having dinner, he produced these documents and asked me if I knew what they were. And when I identified them, he asked that I do some analysis of them.

MR. KATZ: Just for clarity of the record so I don't have to go back and find this later, perhaps the witness

misspoke. You said the affidavit was Exhibit 23. But I think it is Exhibit 24 is what he was talking about because 23 is the one that was marked up.

MR. GOLDENBERG: I think Mr. Katz is right.

MR. KATZ: You might have intended to say 24.

A Well, I am looking at 23 and the contents of the exhibit are essentially the same between both documents 23 and 24. The handwritten notes don't change the --

BY MR. GOLDENBERG:

Q You don't know that, do you, sir, whether they change it or not?

A I made them and I know why I made them.

Q But on Exhibit 23, isn't there an insert A?

A Which is missing.

Q Which is missing and you --

A Yes.

Q And do you know what insert A said?

A No, I don't.

Q So you don't know whether 23 is the same as 24 or not, do you?

MR. KATZ: I object to that as being argumentative with the witness. Obviously if it wasn't there it doesn't change it.

BY MR. GOLDENBERG:

Q You don't know, do you?

MR. NOVAK: The exhibit isn't part of either one right now.

A But I have an opinion.

BY MR. GOLDENBERG:

Q The answer is not there.

A My opinion is that the insert does not essentially change the document.

Q You don't know that, do you? Tell us what the insert was then.

MR. KATZ: It is not there. It can't change it.

I didn't mean to start this. I thought that the witness was expressing that he was --

BY MR. GOLDENBERG:

Q It would be better if you looked at Exhibit 24 as you gave this answer and we can avoid all this.

A Mr. Schnayer asked me at our dinner conference to become familiar with the program again after not seeing it for some period of time.

He asked me if I recalled an open house that has been extensively discussed at these proceedings. And to the best of my recollection, those were the discussions that took place on February 18th this year, 1981.

Q In the course of the dinner conversation, did Mr. Schnayer refresh your recollection in any way about events which occurred in the course of your employment at Cyan

Engineering?

A During our discussions, certain events I recalled not by being told then by Mr. Schnayer but by questions he asked.

Q And he made no suggestions to you about anything that occurred during your employment with Cyan Engineering? Is that what you are telling me?

A Basically, yes.

Q Basically. What do you mean by that? He did or he didn't.

MR. KATZ: I object to that argumentative alternative type of question giving the witness no other possibility.

BY MR. GOLDENBERG:

Q Well, can you answer yes or no?

A He refreshed my memory as to certain events.

Q All right, sir. What events did he refresh your memory about?

A I don't recall those specifics.

Q So at the time you had this first conversation with Mr. Schnayer you didn't have a perfect memory of the events that occurred during your employment with Cyan Engineering? Is that a fair statement, sir?

A That's correct. And I still do not have a perfect memory regarding these events.

Q And certain things which are in your mind now about events were put there as a result of your conversations with Mr. Schnayer? Isn't that a fair statement, sir?

A No, that is not.

MR. KATZ: Objection. Leading.

BY MR. GOLDENBERG:

Q Why not?

A Because he did not tell me about events as they transpired. He asked me a question. He asked me to describe certain events which was in the nature of helping me to remember events that transpired during that period.

Q And he did all of this by asking you questions?

A Yes.

Q He made no suggestions to you?

A No.

Q Let's look at your affidavit, Exhibit 24.

I notice in paragraph three in the second line there is a reference to an electromechanical El Toro pinball machine.

At the time that you had this conversation with Mr. Schnayer, did you have an independent recollection that that was the name of the pinball machine?

A Yes.

Q And that was not suggested to you by Mr. Schnayer?

A No.

Q In lines four and five there is a reference to cable to the El Toro by an umbilical cord.

Where did you get that phrase from, sir?

A Mr. Schnayer asked me how the El Toro was connected to the INTELLEC system.

Q And you used the phrase "umbilical cord"?

A Yes.

Q Is that the way you described it back during your period of employment with Cyan Engineering?

A No. But in the discussions with Mr. Schnayer, that seemed to be a reasonable descriptive way to characterize that connection.

Q Isn't it a fact, sir, that that is a phrase that Mr. Schnayer used before you did?

A That could be.

Q Probably is, isn't it?

MR. KATZ: Objection to that as leading.

MR. GOLDENBERG: It is leading.

A I don't recall who used the phrase first.

BY MR. GOLDENBERG:

Q But it could have been Mr. Schnayer?

A It could have been myself.

Q But it is not a phrase that was ordinarily in your technical parlance, was it, sir?

A Yes.

Q When you were employed at Cyan Engineering?

A During the time I have been involved in the industry I worked in. Umbilical is a term typical in aerospace industry to connect missiles to gantries, and I have done a lot of missile work.

Q Have you ever referred to the interconnection of a computer to a pinball game by that phrase?

MR. KATZ: Objection to the question.

BY MR. GOLDENBERG:

Q Other than in this affidavit?

A I don't recall.

Q Now sir, at the time that you met with Mr. Schnayer on the occasion of this dinner meeting, did you remember your dates of employment?

A No, I did not.

Q Well, you give specific dates here. How did you happen to put those dates in the affidavit?

A I researched my records and found that I had a termination check stub from my employment with Dalmo Victor dated on a Friday prior to March 4th.

I recalled that I took the weekend to move from my residence in San Jose to Grass Valley and began work immediately without any vacation between.

And I found that lease for a rental property that I moved into in the San Mateo area in California upon

termination of my employment with Cyan Engineering, which established those dates for me.

Q Directing your attention to paragraph four of Exhibit 24, you said, (reading) work on the El Toro project continued from the time that I started at Cyan Engineering until approximately June of 1974.

Is that late June or early June? What part of June are we talking about there, sir?

A Approximately June. My recollection is not clear on those dates.

Q You just don't recall whether it was early or late June?

A I don't recall.

Q In the next sentence it says, (reading) to my knowledge no work was done on this project from about early June of 1974 until I left Cyan Engineering on or about August 16, 1974.

Are you sure about that statement, sir?

A I don't recall any work on the project after that period, but I can't state that no work took place. I don't recall any.

Q Did you yourself do any work on the project?

A Not to the best of my recollection.

Q Well, your task was done, wasn't it?

A Yes.

Q That was to write the software?

A Yes.

Q Going on to paragraph five, (reading) for about the first six weeks of my employment at Cyan Engineering there were ongoing discussions concerning our work on the El Toro project between Cyan Engineering personnel and INTELLEC employees and representatives including INTEL, I-N-T-E-L applications engineers.

What INTEL employees did you discuss your work on the El Toro machine with?

A I can't recall the names of the specific INTEL personnel, and my recollection is limited to a phone call that took place between myself and one of the applications engineers at INTEL regarding software programming of the INTELLEC system.

And I recall a visit to the Cyan facility by an INTEL -- I believe he was either an applications engineer or a marketing person to see how we were getting along in using the INTELLEC 4.

Q So you recall one telephone conversation that you had about programming?

A Yes.

Q In the course of that telephone conversation, did you tell this INTEL employee what kind of thing you were working on?

A Not to the best of my recollection, no.

Q And do you recall the name of that employee?

A No, I don't.

Q And do you recall a visit by someone to Grass Valley who was an INTEL employee or a representative of INTEL?

A Yes.

Q Did you have any conversations with that person on that occasion of that visit?

A I believe so.

Q I am sorry?

A I believe so, yes.

Q Do you recall his name?

A No, I don't.

Q Was there more than one?

A I am not certain. I don't recall.

Q What did you talk about?

A I don't recall the specifics. I know I spent only a very few moments with him, exchanged social pleasantries and maybe a few comments regarding software operation. But I don't remember the details of those conversations.

Q I apologize, sir. Did I ask you if there was more than one person?

A Yes.

Q And you said you don't recall?

A Yes.

Q How long did this person or persons stay in Grass Valley to your knowledge?

A Maybe two hours.

Q Are you sure of that?

A No.

Q You are not sure of that at all, are you?

A No.

Q It might have been a very short visit?

A Could be.

Q Isn't it a fact that they only came and delivered some technical literature and left?

MR. KATZ: I object to the question as trying to put your words in his mouth.

MR. GOLDENBERG: I am trying to get the witness to think about it.

A I recall speaking with him briefly. I recall him spending a longer period of time with Steve Mayer. I was not a party to those conversations. I don't know what transpired.

BY MR. GOLDENBERG:

Q But you --

A I don't have a specific recollection of how long he was there. I believe it was less than several hours, and

it could have been much shorter.

Q Much shorter?

A Yes.

Q A few minutes?

A Probably no less than 15 to 20 minutes.

Q Now, in the course of your conversation with this gentleman or these gentlemen, did you tell him or them what you were working on?

A No.

Q Do you know where the visit took place? And I show you Exhibit 25 (indicating)?

A As I recall, it was in the lobby in Steve Mayer's office and in my office.

Q Was the El Toro game in any of these premises during the occasion of this visit?

A My recollection is that the El Toro game at that time was located in the area called lab one.

Q That was just off the lobby?

A Yes.

Q About when did this visit take place, sir?

A I am not certain. Possibly late March.

Q So that would be shortly within the month after you arrived there?

A I believe so.

Q Was it, therefore, during this period that you

were familiarizing yourself with the MCS-4 system?

A Yes, it was.

Q Before you had started to work on the El Toro project?

A I am not sure about that.

Q Sir, continuing it says, (reading) in these discussions we asked technical questions about the operation of INTEL microprocessor related products, including the MCS-4 microcomputer chip set in the INTELLEC development system, how to interface them to the El Toro and other games.

What do you mean by that, sir, or what did you mean when you wrote that statement?

A What I meant was that speaking from my experience the types of questions that I asked them were related to the use and the application of the INTELLEC software and hardware in a general point of view how to interface them with the types of devices we were interfacing them to in the El Toro game without specific mention of the application or the specific circuits that were being used, but rather with regard to the types of components that we were interfacing with.

I believe that Steve Mayer also had discussions with INTEL regarding the use of the INTEL hardware, and that he asked questions relating to the application of that

hardware to various types of interfaces.

Because of the cautions Steve Mayer had given me regarding confidentiality, I don't believe that there were any discussions as to the ultimate application; that is, the El Toro pinball game.

But since I was not a direct party to those conversations, I can't state that that was the case.

Q Why do you believe Steve Mayer had such conversations?

A Because we would periodically discuss difficulties or problems we were having in implementing the design or in formulating the design. He would indicate to me that he was going to call INTEL and get some additional information to assist him in solving these problems.

He would come back later and indicate that he had talked to INTEL representatives and had a better understanding of what the problem was and how to solve it.

Q Sir, what you say there is: (reading) We asked technical questions about the operation of the INTELLEC microprocessor, et cetera.

Is it really the fact of what you are saying that you believe Mr. Mayer asked technical questions? Isn't that really what you know or think you know?

A There was at least one occasion -- I meant we in terms of Cyan Engineering Company.

Q Not yourself?

A Including myself.

On one occasion that I have specific recollection of I did place a telephone call to INTEL, spoke with what I remember to be an applications engineer regarding some technical difficulties or misunderstandings I was having in programming the software.

Q Now, that is what I understood, sir, from your earlier testimony, that your conversation with an INTEL applications engineer went to the matter of programming?

A Yes.

Q So by that statement that I read which starts at the bottom of page one of Exhibit 24 and continues to the top of page two, you do not mean that you yourself had such conversations with INTEL representatives? Other than this one telephone conversation that you have just told us about?

A Yes.

We in that instance is indicative of Cyan Engineering personnel.

Q And your basis for that is what Mr. Mayer said to you?

A Yes.

Q Now, did he ever say to you, I learned this from INTEL, whatever this may have been? Or INTEL told me how

to solve this?

A I don't recall.

Q Mr. Mayer was a pretty smart fellow, wasn't he?

A Yes.

Q Very able engineer, wasn't he?

A Yes.

Q Good designer, wasn't he?

A Yes.

Q Creative person, wasn't he?

A Yes.

Q Very smart man? Wouldn't you agree with that, sir?

A Yes.

Q Learned fast, didn't he?

A Yes.

Q You think he needed a great deal of help from other people?

MR. KATZ: I object to that question as calling for speculation.

MR. GOLDENBERG: Withdraw the question.

BY MR. GOLDENBERG:

Q At the top of page two the sentence, (reading) additionally, such discussions included questions by us about how to program the INTELLEC development system to control the various components of the El Toro and other

games.

Now, what did you mean by that, sir, when you wrote it?

A I was referring to at least the one conversation that I had relating to implementation of various software and lack of clarity on my part as to how to use some of the input/output features of the software and the INTELLEC system that I made a phone call to INTEL to try and clarify my understanding as to how to use some of the program instruments and the input/output provisions of the INTELLEC system.

Q All right, sir. This is one telephone conversation that you have told us about?

A Yes.

Q No others that you recall?

A Correct.

Q Do you recall, sir, what specific program instructions you asked about on the occasion of that telephone conversation?

A No, I do not.

Q Do you recall, sir, whether or not you got answers that made sense to you?

A I believe I did, yes.

Q Now, going on to paragraph six on page two, (reading) Steven Mayer, who is also an employee of Cyan Engineering,

and I were involved in these discussions.

After what you have just said, isn't that a bit of an overstatement?

A I don't think so. I think it is accurate.

Q You were only involved in one telephone conversation?

A I was involved in one that I can specifically recall.

Q You have no recollection of any more, do you?

A No.

Q And you don't know whether Steve Mayer had any telephone conversations or not, do you?

A I believe he did.

Q But you don't know that, do you?

A No, I don't.

Q So that is an overstatement, isn't it?

MR. KATZ: I object to the question as leading. Again, you are putting words in his mouth. He said it wasn't.

MR. GOLDENBERG: Well, I am reminding him to think about it and see if he won't change his testimony.

A I think it is completely accurate. There were discussions that took place, as stated in the affidavit. Steve Mayer and I were involved in those discussions.

BY MR. GOLDENBERG:

Q Discussions that you don't know anything about?

MR. KATZ: That is not what he said.

BY MR. GOLDENBERG:

Q Isn't that true?

MR. KATZ: He said Steve Mayer told him about those discussions.

BY MR. GOLDENBERG:

Q You don't know whether Steven Mayer had any discussions about these matters with INTEL, do you? You just don't know?

A Steve Mayer told me firsthand from his own mouth that he had had these discussions. Unless he lied to me, I have knowledge that he had these discussions.

Q The last sentence of paragraph six on page two of the exhibit, (reading) my participation in these discussions included telephone calls from me to INTEL applications engineers referred by Steve Mayer.

Well, at this point you only recall one such discussion; isn't that true?

A I recall one specific conversation. There may have been others. I have specific recollection of one.

Q But you don't really recall that there was more than one?

A That's correct.

Q So it isn't quite accurate to refer to them as

your participation in these discussions, is it?

A That is at that time quite correct.

It might be more accurate to say in a single discussion. That would be absolutely accurate.

Q Being absolutely accurate is a matter of some moment when you are making an affidavit, isn't it?

A Yes. But I also believe that I had some participation in some of Steve Mayer's calls. Not directly but in suggesting topics or questions to be clarified during his conversations.

Q I have your testimony, sir.

MR. NOVAK: If you wish to continue or elucidate or complete your answer, you may do so. I don't know if you were finished on that last answer.

A There were more than one discussion that took place between Steve Mayer and INTEL people, to the best of my recollection, based on his information that he conveyed to me. We worked very closely on this project, and there were some times where we talked about certain difficulties and problems that arose. And we discussed the contents of his concerns relating to these issues.

BY MR. GOLDENBERG:

Q Tell me some of the difficulties and problems you spoke of with Mr. Mayer that arose.

A I don't recall the specifics of those.

Q Do you recall difficulties and problems that arose that Mr. Mayer was able to solve without calling INTEL?

A Of course.

Q A great number of them?

A Most of them.

Q Most of them. By far most of them, isn't that true?

A Yes.

Q Why didn't you put that in the affidavit?

A Is that a question you want me to answer?

Q Yes, sir.

MR. KATZ: I object to the question as being rhetorical.

MR. GOLDENBERG: That was a rhetorical objection.

BY MR. GOLDENBERG:

Q Please answer the question, sir.

A I wasn't trying to describe the number of problems that arose and how each one was resolved.

I was trying to describe what involvement INTEL had in the development of our El Toro game and what knowledge they may have had of that development and the extent to which they had been consulted with regard to our application of their INTELLEC system.

Q Why weren't you trying to tell about all of the

events in the development of the El Toro system? Why didn't you think that was worthwhile to put in the affidavit?

MR. KATZ: I object to the question as lacking foundation.

MR. GOLDENBERG: Well, the witness just told us what he was trying to tell.

MR. KATZ: He told you.

BY MR. GOLDENBERG:

Q Could you answer the question, sir?

A What is the question, please?

(Referred to testimony read by Reporter.)

A There were certain topics that were of interest to Mr. Schnayer's firm or to Mr. Schnayer, I don't know which, which he conveyed to me and asked that I prepare an affidavit addressing those issues. And this affidavit was limited to those issues.

BY MR. GOLDENBERG:

Q Tell me those certain topics that Mr. Schnayer was interested in.

A They are covered in the affidavit. They include my dates of employment there, some specifics as to how deeply the INTELLEC system or 4004 was embedded within the El Toro game, what knowledge INTEL may have had of those developments.

He asked me to identify what we have labelled as Exhibits 16 and 20 and to analyze those and to state in the affidavit the reaction of the program to stuck switches or multiple switch closures.

He asked me to address certain, let's call them production testing type evaluations such as response to the static.

He asked me what I knew about the qualifications of the various Cyan Engineering people with regard to development of pinball machines.

He asked me about the open house.

Q So he wasn't interested in the complete story of the El Toro development, was he?

MR. KATZ: I object to the question as asking for what Mr. Schnayer was interested in or wasn't interested in and I think there is absolutely no foundation for that question and there is no way this witness would know what Mr. Schnayer was interested in.

BY MR. GOLDENBERG:

Q Have you completed your list of your understandings of what Mr. Schnayer wanted in the affidavit, sir?

A Yes.

There were no topics that he asked for information on that were not included in the affidavit.

Q So he wasn't interested in the complete story of

the El Toro development?

MR. KATZ: Same objection.

A I don't know that he wasn't interested.

BY MR GOLDENBERG:

Q He didn't want in the affidavit, did he?

MR. KATZ: I object to that. Again you are putting your words in his mouth.

MR. NOVAK: Mr. Goldenberg, I think it is improper for you to be asking what Mr. Schnayer was interested in.

If you asked what he asked about or what was done, fine. What was in Mr. Schnayer's mind this witness cannot testify to.

BY MR. GOLDENBERG:

Q Did Mr. Schnayer want the complete story of the El Toro development?

MR. KATZ: Again, what does he want? How does he know what he wants?

MR. GOLDENBERG: What he told him, sir.

A I told you what issues he wanted included in the affidavit, sir. I don't know what his motivation was.

MR. KATZ: I object to the question also on the ground that it goes to the mental thought process of somebody else, somebody other than this witness.

BY MR. GOLDENBERG:

Q This is your affidavit, isn't it, sir?

A Yes.

Q Did you write it?

A Gerry Schnayer and I wrote it in conjunction.

Q How was that done mechanically?

A We sat down and we took each topic and we agreed upon the specific wording to be used in addressing that issue.

Q Did he make suggestions as to wording?

A No. Generally it was -- He tried to make suggestions as to how to separate the various issues and address the certain issues so that they would be clear.

And I was -- I dictated the specific wording to be used, and he wrote it down.

Q Did you think it important enough to say to Mr. Schnayer that look, Mr. Schnayer, Mr. Steven Mayer is a very able engineer, very talented, perfectly capable of designing a process or control of a pinball game? Did you say that to him?

MR. KATZ: I object to this. There is no indication at all that this is in dispute here. What kind of able engineer Mr. Mayer is or was at that time isn't in issue.

BY MR. GOLDENBERG:

Q Did you say that to him, sir?

A Why should I say that? I was an able software

programmer. I didn't tell him that I was a very capable software engineer.

Q But did you think it worthwhile to put this affidavit in here to create an impression that Mr. Mayer was depending on INTEL to tell him how to do this?

MR. KATZ: Objection to that.

BY MR. GOLDENBERG:

Q Isn't that a fact?

A No, it is not.

If you would let me elucidate on what happens when new hardware is made available to designers, I could explain the situation. Which I think is very characteristic of all the developments.

Q What I am inquiring into is the preparation of this affidavit.

A It is a fact that Steve Mayer consulted INTEL regarding the operation of their hardware, and he consulted with them for details as to how to apply it.

Q Well sir, did you mean to create the impression in this affidavit that Steve Mayer didn't know what he was doing?

A No. And I do not interpret this affidavit to make that interpretation.

Q So you intended nothing like that impression to be created by this affidavit?

A No.

Q And if anyone got that impression, they would have an erroneous conclusion, wouldn't they?

MR. KATZ: Objection to that question as going to what is in the mind of someone else.

A What I meant to state in the affidavit is that Steve Mayer and I were working with a new piece of microprocessor development hardware that we were both unfamiliar with with the first edition of documentation which, in some cases, was incomplete and in others was inaccurate. And that our conversations with INTEL were to clarify our understanding of how the INTELLEC system operated and how to apply it and to enhance our understanding of those issues so that we could successfully execute the El Toro project.

BY MR. GOLDENBERG:

Q I would ask you to tell me to the extent that you recall what specific items of information Steven Mayer got from INTEL that ended up in the El Toro game.

A I have told you I didn't recall.

Q Let's go on to paragraph nine on page two.

What do you mean in that paragraph when you refer to a "stuck switch"?

A That is stated in that sentence. It says, (reading) a continuous closure of a playfield switch. Condition where the switch always remains closed.

Q It doesn't say closed, does it?

A (Reading) As a result, continuous closure of a playfield switch as in the case of a stuck switch referring to continuous closure. It says that to me.

Q All right. So you mean stuck closed, is that right?

A Yes.

Q Now, do you recall your examination by Mr. Leach this morning?

A Yes.

Q About what would happen in the case of a switch which was stuck in the closed position?

A Yes.

Q Do you still want to say that that statement in paragraph nine is correct?

A Yes, it is.

Q Now, how does it prevent proper response of the game to other switches?

A Well, as we discussed in relationship to the use of registers 4 and 5 in the program of Exhibit 20. While the switch is closed, register 5 will remain in a zero condition indicating that playfield switches are never all in an open state.

That condition will prevent the software from executing the various switch service and score service

functions. It will prevent the lighting of any lights, the registering of any scores, the ringing of any chime or the activation of a solenoid.

Q This is when the switch is stuck in a closed position?

A Yes.

Q Didn't you also tell Mr. Leach this morning that when the switch was stuck in a closed position, that it would go onto the next switch? Didn't you tell him that, sir?

A Yes.

It bypasses that portion of the program which activates those devices I spoke of a moment ago being the score, the solenoids, the chimes and so forth.

Q But it will go on and poll or sense the condition of the next switch in the sequence, won't it?

A Internally to the software, yes, it will.

Q It will do that?

A Yes.

Q And if a switch is closed, it is going to register score, it is going to light lights, it is going to operate solenoids, do whatever is proper?

A No, it will not.

Q You are sure of that?

A I'm absolutely positive.

That is why the statement that the machine will hang up in a nonoperative state. The software will continue to execute, but it will cease to respond to switch closure other than the stuck switch and will appear to a player from a player's perspective as a nonoperative machine.

Q All right, sir.

During any of the testing that you did with El Toro connected up to the microprocessor, the INTELLEC development system, did you ever encounter a stuck switch?

A Not that I recall.

Q Did you ever encounter a switch stuck open?

A I believe there was at least one occasion where the switch contact had been bent. And although the ball rolled over the switch, it did not register the closure within the microprocessing system and that -- That was observed and corrected by bending a switch contact.

Q And did you ever encounter a situation in any of your playing or testing of the game where a switch was stuck in a closed position?

A Not that I recall.

MR. NOVAK: Excuse me. Off the record.

(Discussion held off the record after which the deposition was continued.)

I hereby certify that I have read and subscribe to the foregoing deposition.

Gregory Cox, Deponent

INDEX TO WITNESS

INDEX TO EXHIBITS

I hereby certify the above signature was placed in my presence October 12, 1981. I am a duly authorized Notary Public in Dauphin County, Commonwealth of Pennsylvania.

Susan M. Simon

INSTRUCTIONS TO DEPONENT FOR READING AND SIGNING DEPOSITION

By law you are entitled to read, list changes and your reasons therefore, and sign your deposition.

Do not deface the deposition by making changes on the deposition. Changes in form or substance must be listed below by page and line number, the change, and your reason therefore.

Sign your name on the line below and return this form (and any additional sheets) to the address below.

This is a legal document and must be returned for filing along with the original transcript of your deposition within 30 days. If not returned, or returned unsigned, the deposition will be filed stating the reason(s) for noncompliance.

If you have any questions, you may call your attorney, or call Geiger & Loria Reporting Service.

FILED

CERTIFICATE OF DEPONENT

Baily vs. D. Gottlieb, et al, U.S. District Court, No. 78 C 2246
Caption and Venue

Gregory Cox — September 11, 1981
Name of Deponent — Date of Deposition

I, the undersigned, hereby certify that I have read the foregoing described deposition and that to the best of my knowledge it is true and accurate (with the exception of the following changes:)

PAGE	LINE	CHANGE	REASON FOR CHANGE
7	5	MR. LEACH's To MR. KATZ's	Incorrect recall of Mr. Katz's name
27	24	LDE's to LED's	Typo
101	21	Exhibit 21 to Exhibits.	Incorrect reference to exhibits
170	19	TENTHS TO TENS	TRANSCRIPTION ERROR
170	20	HUNDREDTHS To HUNDREDS	" "
170	20	THOUSANDTHS To THOUSANDS	" "
175	11	TENTHS To TENS	" "
175	13	HUNDREDTHS To HUNDREDS	" "
175	15	THOUSANDTHS To THOUSANDS	" "
176	7	SELF-WORD To SOFTWARE	" "

Oct. 12, 1981
Date

Gregory Cox
Signature of Deponent

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717/234-2109

I hereby certify the above signature was placed in my presence on October 12, 1981. I am a duly authorized Notary Public in Dauphin County, Commonwealth of Pennsylvania.

Notary Public

176	23	FOR TO OR	TRANSCRIPTION	ERROR
183	13	SELF-WORD TO SOFTWARE	"	"
186	9	FULLED TO FELLED	"	"
188	21	235 to ?	"	"
189	4	LIGHT TO PLAY	"	"
191	9	FLOAT TO FLOW	"	"
191	24	FLOAT TO FLOW	"	"
193	7	" " "	"	"
193	14	" " "	"	"
193	17	" " "	"	"
~~194~~	~~4~~	~~THE TO A~~	"	"

~~Cannot be certain the first page of exhibit has any relationship to the text.~~

198	13	IN TO AND	TRANSCRIPTION	ERROR
205	24	METRICS TO MATRIX	"	"
206	7	" " "	"	"
206	11	" " "	"	"
206	22	" " "	"	"
207	6	" " "	"	"
207	14	" " "	"	"
207	21	" " "	"	"
208	1	" " "	"	"
208	4	VECTR TO VECTOR	"	"
208	5	" " "	"	"
208	6	METRICS TO MATRIX	"	"
221	2	INTERLETING TO INTERFACING	"	"
221	20	ETRICS TO MATRIX	"	"
237	7	JOINT TO JOY	"	"
250	1	INTELLECT TO INTEL	"	"
278	19	FLOAT TO FLOW	"	"

I hereby certify the following signature was placed in my presence on October 12, 1981. I am a duly authorized Notary Public in Dauphin County, Commonwealth of Pennsylvania.

~~Susan M. Simon~~

Oct 13, 1981

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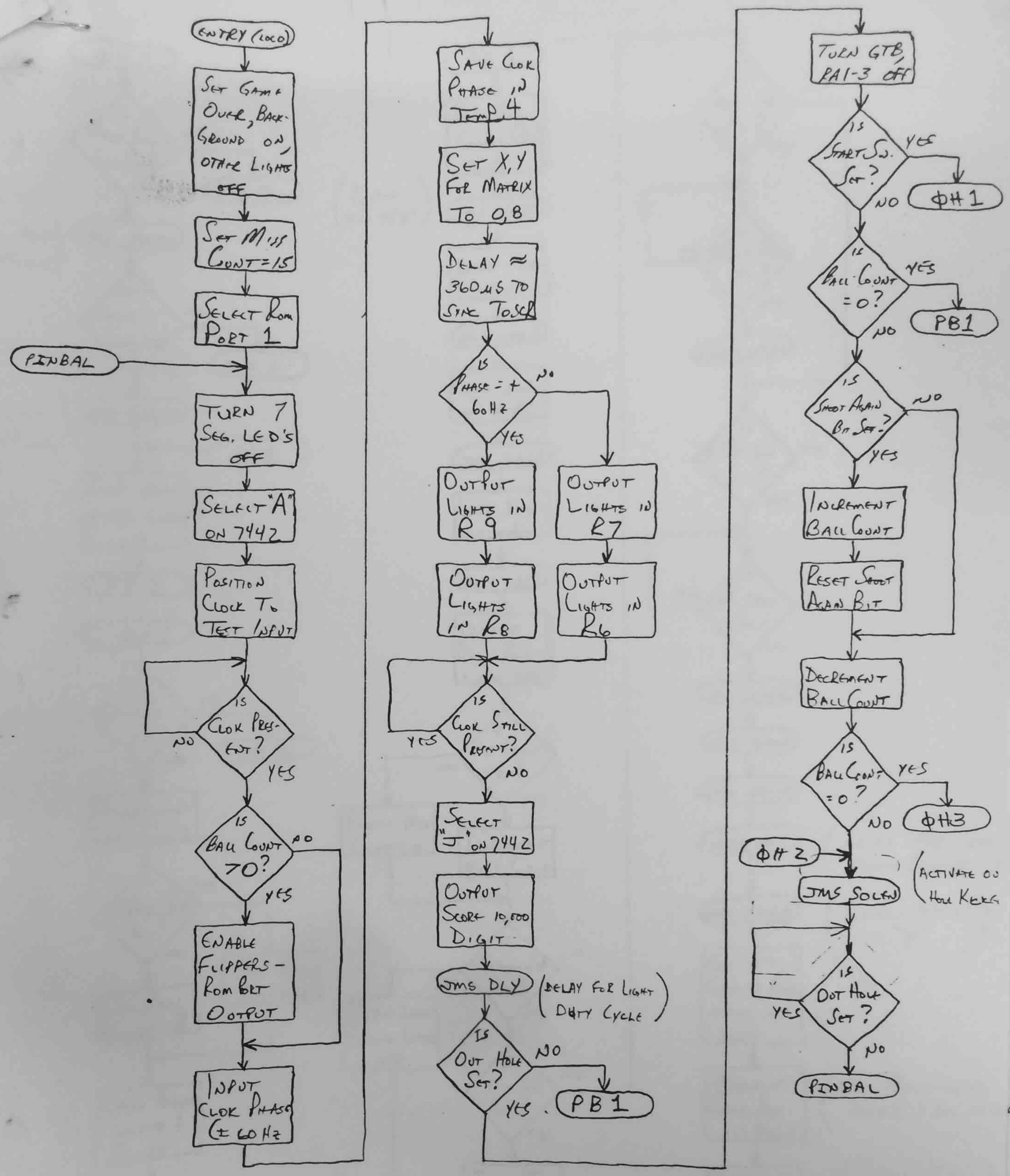

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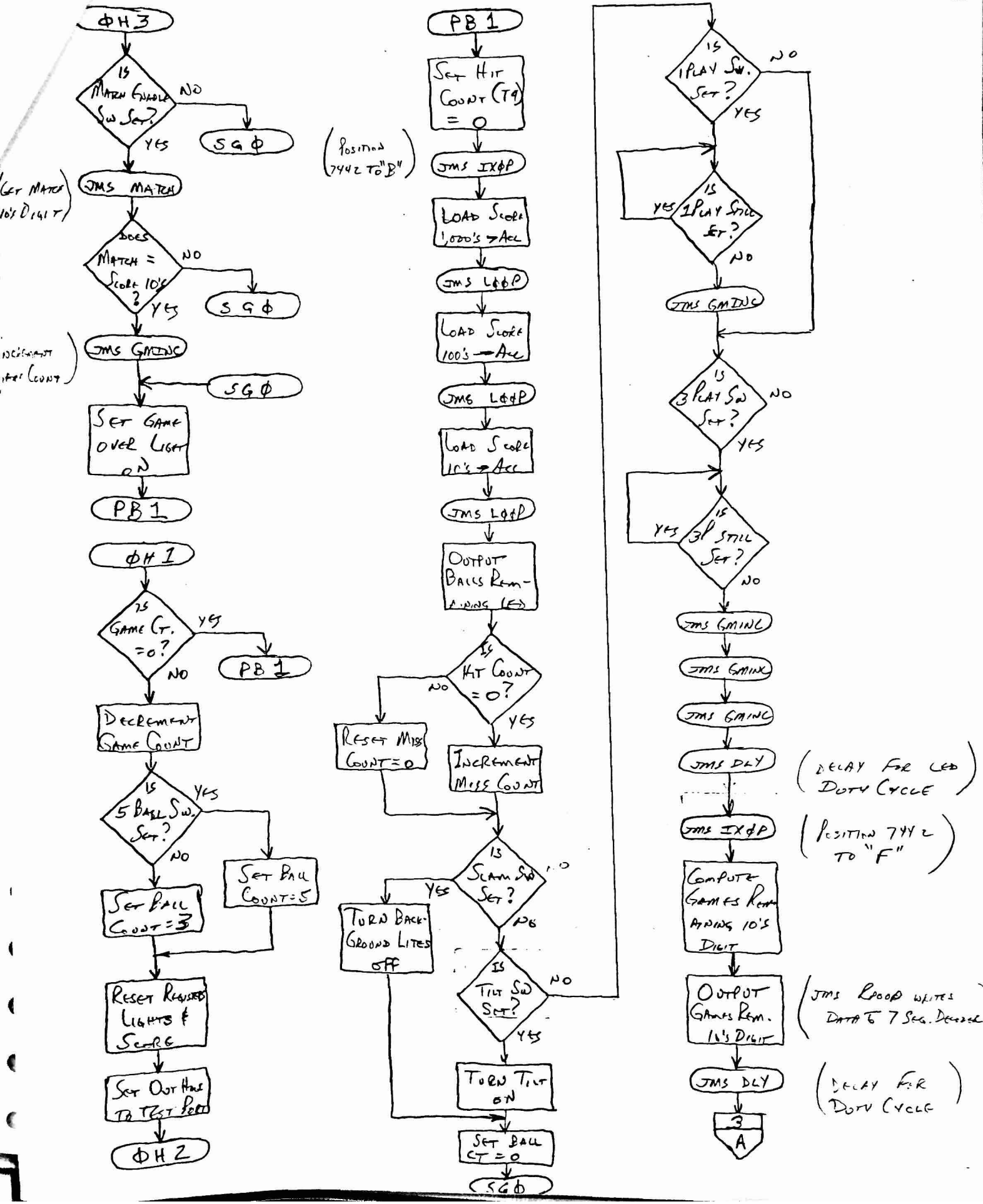
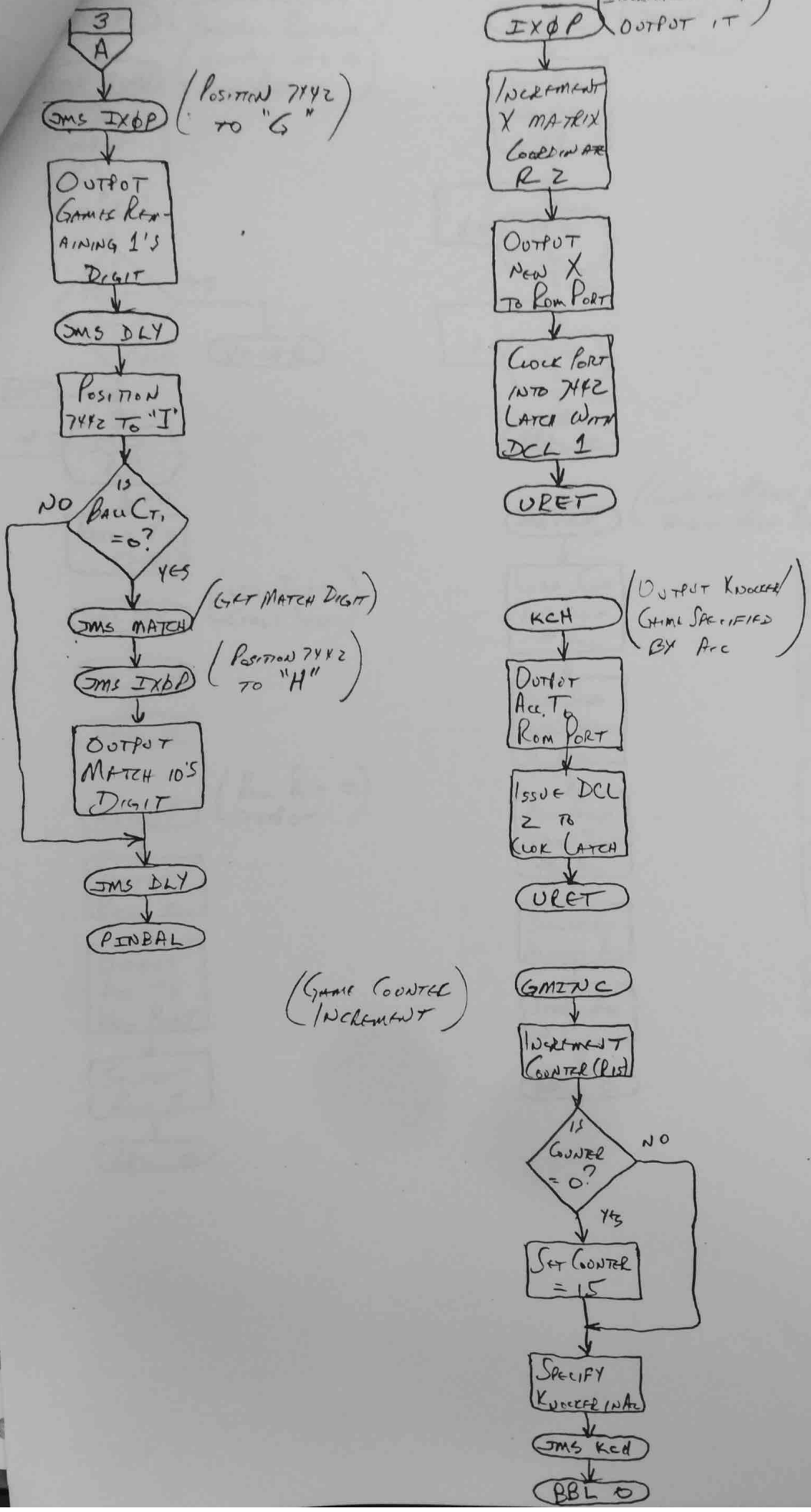
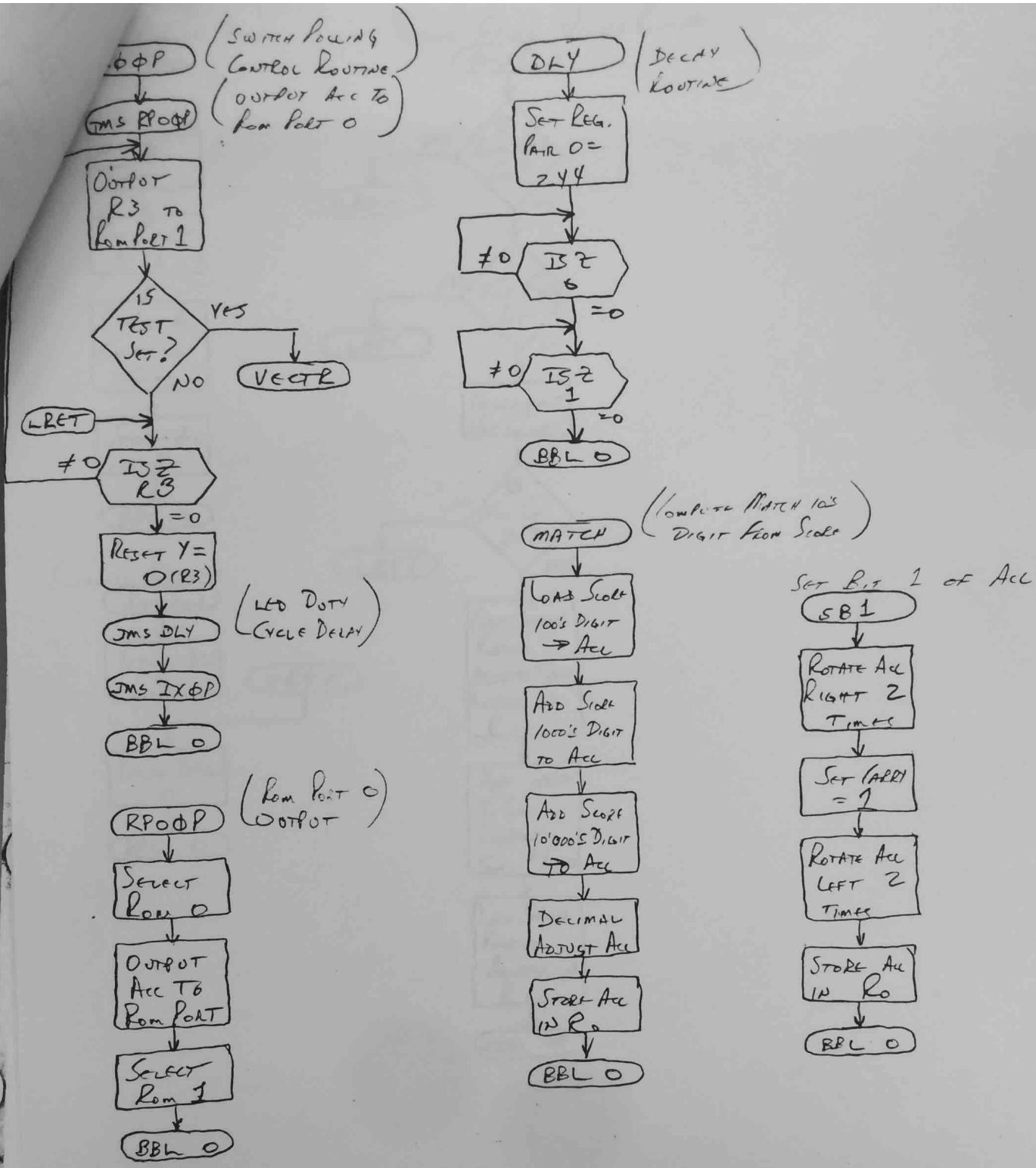
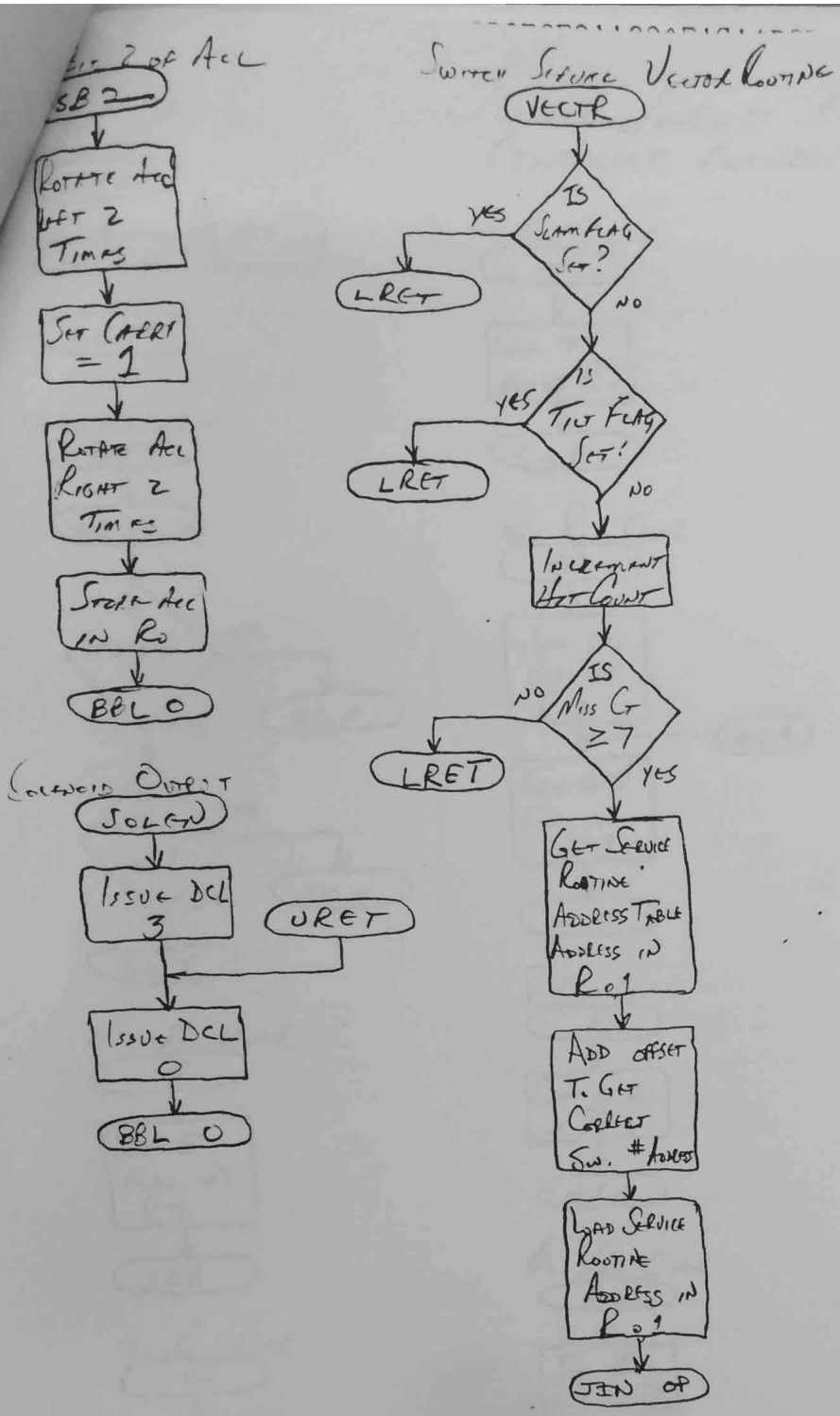
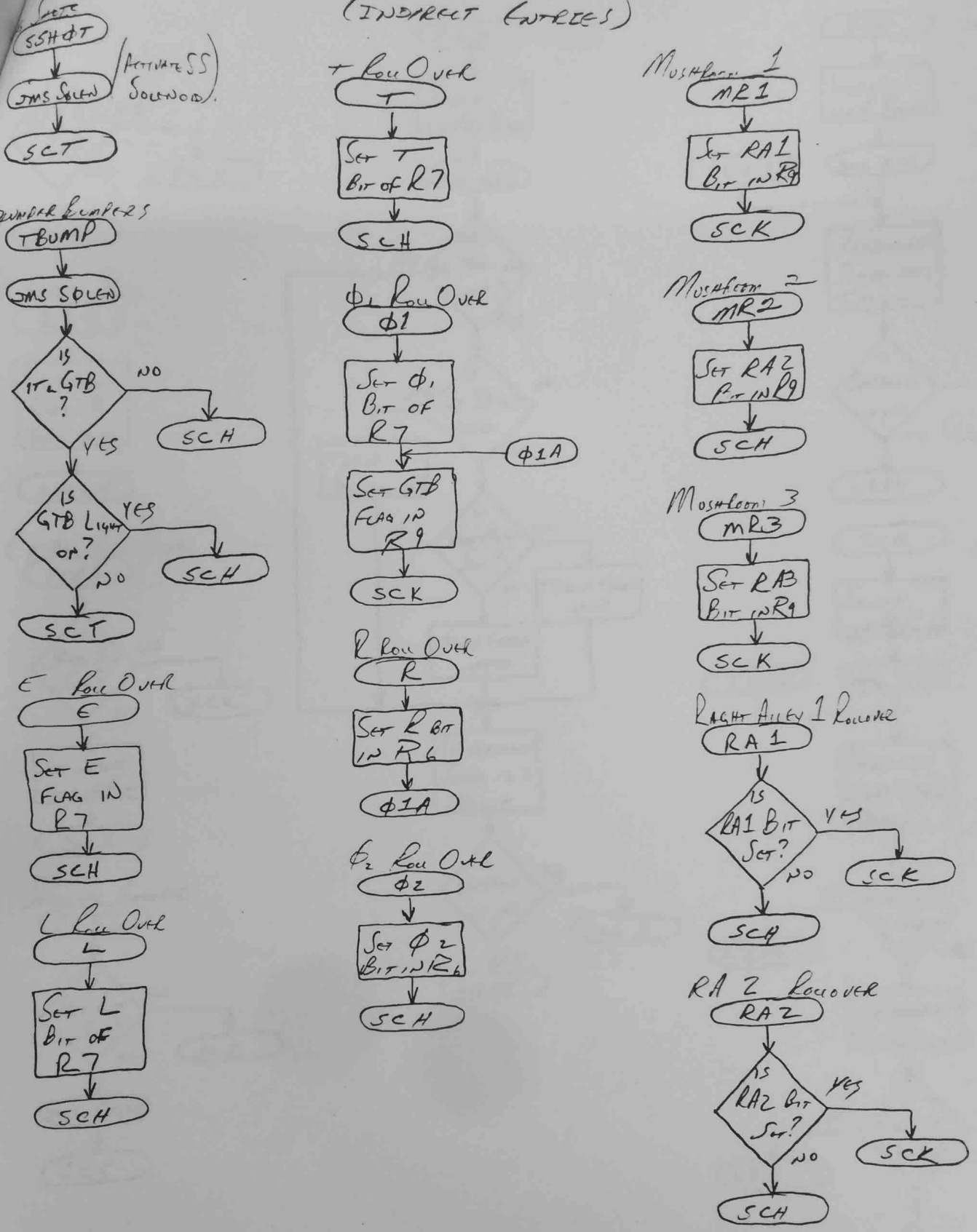

ΦH3
IS MATCH ENABLE SW SET?
NO
YES
SGΦ
JMS MATCH
(GET MATCH 10's DIGIT)
DOES MATCH = SCORE 10's ?
NO
YES
SGΦ
JMS GMINC
(INCREMENT GAME COUNT)
SGΦ
SET GAME OVER LIGHT ON
PB1
ΦH1
IS GAME CT. =0?
YES
NO
PB1
DECREMENT GAME COUNT
IS 5 BALL SW. SET?
YES
NO
SET BALL COUNT=5
SET BALL COUNT=3
RESET REQUIRED LIGHTS & SCORE
SET OUT HOLE TO TEST PORT
ΦH2
PB1
SET HIT COUNT (T9) = 0
(POSITION 7442 TO "B")
JMS IXΦP
LOAD SCORE 1000's → ACC
JMS LΦΦP
LOAD SCORE 100's → ACC
JMS LΦΦP
LOAD SCORE 10's → ACC
JMS LΦΦP
OUTPUT BALLS REMAINING (E9)
IS HIT COUNT =0?
NO
YES
RESET MISS COUNT=0
INCREMENT MISS COUNT
IS SCRN SW SET?
YES
NO
TURN BACK-GROUND LITES OFF
IS TILT SW SET?
NO
YES
TURN TILT ON
SET BALL CT=0
SGΦ
IS 1PLAY SW. SET?
NO
YES
IS 1PLAY STILL SET?
YES
NO
JMS GMINC
IS 3PLAY SW SET?
NO
YES
IS 3P STILL SET?
YES
NO
JMS GMINC
JMS GMINC
JMS GMINC
JMS DLY
(DELAY FOR LED DUTY CYCLE)
JMS IXΦP
(POSITION 7442 TO "F")
COMPUTE GAMES REMAINING 10's DIGIT
OUTPUT GAMES REM. 10's DIGIT
(JMS LΦΦP WRITES DATA TO 7 SEG. DECODE)
JMS DLY
(DELAY FOR DUTY CYCLE)
3
A


3
A
JMS IXØP
(POSITION 7Y4Z TO "G")
OUTPUT GAMES REMAINING 1'S DIGIT
JMS DLY
POSITION 7Y4Z TO "I"
IS BALL CT. =0?
NO
YES
JMS MATCH
(GET MATCH DIGIT)
JMS IXØP
(POSITION 7Y4Z TO "H")
OUTPUT MATCH 10'S DIGIT
JMS DLY
PINBAL
IXØP
(INCREMENT X & OUTPUT IT)
INCREMENT X MATRIX COORDINATE R 2
OUTPUT NEW X TO ROM PORT
CLOCK PORT INTO 7Y4Z LATCH WITH DCL 1
URET
KCH
(OUTPUT KNOCKER/GAME SPECIFIED BY ACC)
OUTPUT ACC. TO ROM PORT
ISSUE DCL 2 TO CLOK LATCH
URET
(GAME COUNTER INCREMENT)
GMINC
INCREMENT COUNTER (PIST)
IS COUNTER =0?
NO
YES
SET COUNTER =15
SPECIFY KNOCKER IN ACC
JMS KCH
BBL 0

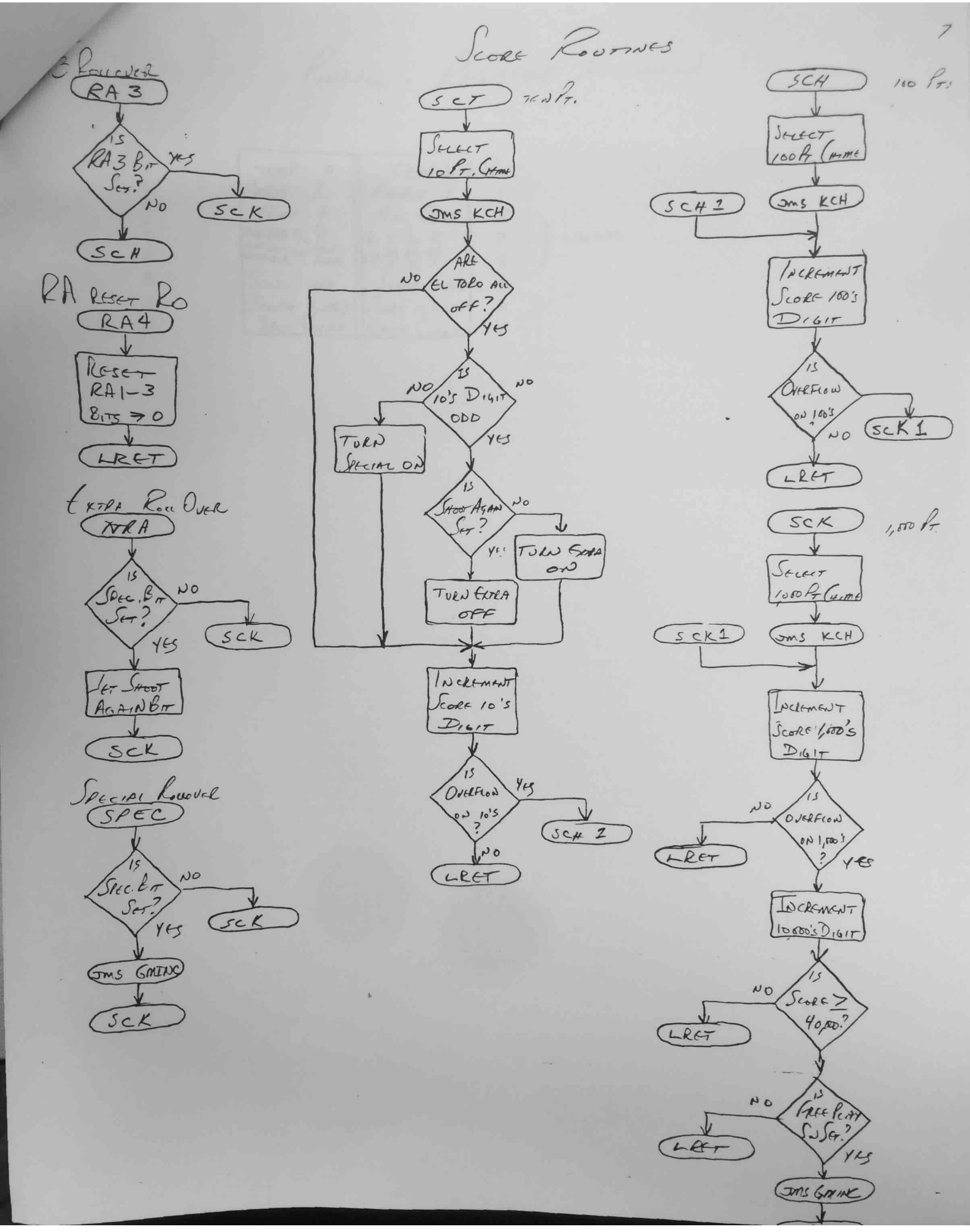

.ΦΦP
(SWITCH POLLING CONTROL ROUTINE)
JMS RPΦΦP
(OUTPUT ACC TO ROM PORT 0)
OUTPUT R3 TO ROM PORT 1
IS TEST SET?
YES
NO
VECTR
LRET
≠0
ISZ R3
=0
RESET Y=0 (R3)
(LED DUTY CYCLE DELAY)
JMS DLY
JMS IXΦP
BBL 0
(ROM PORT 0 OUTPUT)
RPΦΦP
SELECT ROM 0
OUTPUT ACC TO ROM PORT
SELECT ROM 1
BBL 0
DLY
(DECAY ROUTINE)
SET REG. PAIR 0=244
≠0
ISZ 6
=0
≠0
ISZ 1
=0
BBL 0
MATCH
(COMPUTE MATCH 10'S DIGIT FROM SCORE)
LOAD SCORE 100'S DIGIT → ACC
ADD SCORE 1000'S DIGIT TO ACC
ADD SCORE 10'000'S DIGIT TO ACC
DECIMAL ADJUST ACC
STORE ACC IN R0
BBL 0
SET BIT 1 of ACC
SB1
ROTATE ACC RIGHT 2 TIMES
SET CARRY = 1
ROTATE ACC LEFT 2 TIMES
STORE ACC IN R0
BBL 0


Bit 2 of Acc
SB 2
Rotate Acc Left 2 Times
Set Carry = 1
Rotate Acc Right 2 Times
Store Acc in R0
BBL 0
Solenoid Output
SOLCN
Issue DCL 3
URET
Issue DCL 0
BBL 0
Switch Service Vector Routine
VECTR
Is Scan Flag Set?
YES
LRET
NO
Is Tilt Flag Set?
YES
LRET
NO
Increment Hit Count
Is Miss Ct ≥ 7
NO
LRET
YES
Get Service Routine Address Table Address in R0,1
Add offset To Get Correct Sw. # Address
Load Service Routine Address in R0,1
JIN 0P

Switch Service Routines (Indirect Entries)



Score Routines



PINBALL - REGISTER ALLOCATION

R_0		R_1	
0	TEMP 0	TEMP 1	1
2	MATRIX X	MATRIX Y	3
4	TEMP 4	MISS COUNT	5
6	SPECXTRA Φ_2 R	Φ_1 T L E	7
8	BACK-GROUND SAME PLAYER TILT SHOOT AGAIN	GID RA 3 RA 2 RA 1	9
A	SCORE 10's	SCORE 100's	B
C	SCORE 1,000's	SCORE 10,000's	D
E	BALL COUNT	GAME COUNT	F

} LIGHTS

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EXHIBIT
Greg Cox, 27
dr 9/18/81

Row 2 Large Document

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Run 3

3100,1FF

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BPPPNNPPNF	BPNPPNNPNF	BPNNNPPPPF	BPNPNPPPPF
BPNPPPPPPF	BPPPPPPNPF	BNNPNPNPPF	BNNNPPPNPF
BPPPNPPPNF	BPNNPPPNNF	BPNPNPPNPF	BPPNPPPPPF
BNNNNPPPNF	BNPNPPPPPF	BNPPNNPNPF	BPPPNNNPPF
BPNNPPPNNF	BPNPNPPPPF	BNNNNNPNPF	BNPNPNPPPF
BPNPNPPNPF	BPPNPNNNNF	BNPNPPPPPF	BNPNNNPPPF
BPNPPPPPPF	BNPPPPNNPF	BNNPNPNNPF	BNNNPPPNPF
BPPPNPPPNF	BNPPPPNNPF	BNPNPNNNNF	BPPPNPNPPF
BNPPPPNNPF	BNNNNNPPPF	BNPNNNNNNF	BNNPNPNNNF
BNNNPPPNPF	BNNPNPPNNF	BPPPNPPPNF	BPNNNNPPNF
BNNPNPNPNF	BNPNNNNNPF	BPPNPPNNPF	BPPPPPPPPF
BPPNPNPPPF	BNPPPPPPPF	BPPNPNPNPF	BPPPPPPPPF
BPPNPNNPPF	BPPPPPPPPF	BNNPNPNPNF	BNNNPPPNPF
BPNPPPPPPF	BPNPPNNPNF	BNNNNPPPPF	BNPNNPNPPF
BPNPNPPPPF	BNNNPNNNPF	BNPNPNNPPF	BPNPPPPNNF
BPNPPPPPPF	BNPNPNPNNF	BPNPNPPNPF	BPPPPPPPPF
BNPNPNPNPF	BPNPNPPNPF	BPPPPPPPPF	BNPNPNNNPF
BPNPNPPNPF	BPPPNPPPNF	BNNNPPPNPF	BNPNPPNPPF
BPPPNPNPPF	BNPPNNNNPF	BNNNNPPPPF	BNPNNPNPNF
BPNPPPPPPF	BNPNPPPNPF	BPNNNPNPNF	BNPNPPPNPF
BNNPNNNNNF	BNPNNPNPNF	BPPPNPPPNF	BNPNPNNPPF
BNPNPNPPPF	BNNNNPNPNF	BNNNNPPPNF	BNNNNPNNPF
BNPNNNPPPF	BNNNNPPPPF	BPNPPPPPPF	BNPNNPNPNF
BNNPNPPPNF	BNNNPPPNPF	BPPPNPPPNF	BNPNNNPPNF
BNPNPNPPPF	BPNPNPPNPF	BPPNPNPPPF	BNPNPPPPPF
BNPNNNPPPF	BNNNNPPPPF	BNPNNNNNPF	BPNPPPPPPF
BPNNPPPNNF	BNNPNPNNPF	BNNNPPPNPF	BPPPNPPPNF
BNNPPPPNPF	BPNPPPPNPF	BNPPNNPPPF	BNNNNPPPPF
BPNPPPPPPF	BNNPPNNPPF	BNNPNPNNNF	BNNNPPPNPF
BPPPNPPPNF	BNNPPNNPPF	BPNPPPPNNF	BPPPPPPPPF
BPNPNPPPPF	BNNNNNPNPF	BPNPNPPPPF	BNNNNNPNPF
BPNPNPPNPF	BPPPNNPPNF	BPNPNPPPPF	BNNNPNNNPF
BNPNPNNNNF	BNNNNPPPNF	BNNNNNPNNF	BNPNNPNPPF
BNNNNPNNNF	BPNPNPPNPF	BPPPNPPPNF	BPNPNPPNPF
BPPPNNPPNF	BPNPNPPPPF	BNNNPNNNPF	BNPNPPNPPF
BPNPNPPNPF	BPPPNPPPNF	BPNPNPPNPF	BPPPNNPPNF
BPNPPPPNPF	BPNNPNNNPF	BNPNPNNNPF	BPPPNNNPPF
BNNNPNPNPF	BPNPPPPNNF	BPPPPNNPNF	BNPNPPPPPF
BPNPNPPNPF	BPPPNPPPNF	BPNPNPPNPF	BPPPNNPPNF
BPNPPPPNPF	BPNNPNPPNF	BPNNPPPNPF	BNPNPPPNPF
BNNNPPPNPF	BNNPNPPPNF	BNNNNNNPNF	BPNPPPPNPF
BPPNNNPPPF	BNNNPPPNPF	BNNPNPPNPF	BNNNNNNPNF
BPNPPPPNPF	BPPNNNPPPF	BPNNNNNNNF	BNNNNNNNPF
BNNPNNNNNF	BNPNNNNNNF	BNNPNPPNNF	BPNPNPPPPF

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